GURU KASHI UNIVERSITY
PUNJAB - INDIA

Program Syllabus Booklet

Bachelor in Technology in Electrical Engineering (B. Tech EE-103)

Session: 2017-18

Guru Gobind Singh College of Engineering and Technology
Guru Kashi University, Talwandi Sabo

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Introduction of Program

Electrical Engineering (sometimes referred to as **Electrical and Electronic Engineering**) is a professional engineering discipline that deals with the study and application of electricity, electronics and electromagnetism. The field first became an identifiable occupation in the late nineteenth century with the commercialization of the electric telegraph and electrical power supply. The field now covers a range of sub-disciplines including those that deal with power, optoelectronics, digital electronics, analog electronics, computer science, artificial intelligence, control systems, electronics, signal processing and telecommunications.

The term electrical engineering may or may not encompass electronic engineering. Where a distinction is made, electrical engineering is considered to deal with the problems associated with large-scale electrical systems such as power transmission and motor control, whereas electronic engineering deals with the study of small-scale electronic systems including computers and integrated circuits. Another way of looking at the distinction is that electrical engineers are usually concerned with using electricity to transmit energy, while electronics engineers are concerned with using electricity to transmit information.

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Aneexure-1

Semester: 1st (Physics Group)										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	100101	Communicative English	T	3	0	0	3	50	50	100
2	100103	Engineering Mathematics-I	T	4	1	0	5	50	50	100
3	100104	Engineering Physics	T	3	1	0	4	50	50	100
4	102101	Fundamental of Computer Programming & Information Technology	T	3	0	0	3	50	50	100
5	104101	Basic Electronics & Communication	T	3	1	0	4	50	50	100
6	100105	Communicative English Laboratory	P	0	0	2	1	60	40	100
7	100107	Engineering Physics Laboratory	P	0	0	2	1	60	40	100
8	102102	Fundamental of Computer Programming & Information Technology Lab	P	0	0	4	2	60	40	100
9	104102	Basic Electronics & Communication Lab	P	0	0	2	1	60	40	100
10	105104	Manufacturing Practice	P	0	0	6	3	60	40	100
Total No. of Credits				27						

Semester: 2nd (Chemistry Group)										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	100102	Engineering Chemistry	T	4	1	0	5	50	50	100
2	100201	Engineering Mathematics-II	T	4	1	0	5	50	50	100
3	103101	Basic Electrical Engineering	T	4	1	0	5	50	50	100
4	105101	Elements of Mechanical Engineering	T	4	1	0	5	50	50	100
5	105102	Engineering Graphics & Drawing	T/P	1	0	6	4	50	50	100
6	100106	Engineering Chemistry Laboratory	P	0	0	2	1	60	40	100
7	103102	Basic Electrical Engineering Lab	P	0	0	2	1	60	40	100
8	105103	Computer Graphics Lab	P	0	0	2	1	60	40	100
Total No. of Credits				27						

Semester: 3rd										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	100301	Engineering Mathematics-III	T	3	1	0	4	50	50	100
2	100302	Environmental Science	T	3	1	0	4	50	50	100
3	102304	Programming in C++	T	3	1	0	4	50	50	100
4	103301	Electrical Measurements and Measuring Instruments	T	3	1	0	4	50	50	100
5	103302	Magnetic Circuits & Transformers	T	3	1	0	4	50	50	100
6	104302	Network Analysis & Synthesis	T	3	1	0	4	50	50	100
7	102306	Programming in C++ Lab	P	0	0	2	1	60	40	100
8	103303	Electrical Measurements and Measuring Instruments Lab	P	0	0	2	1	60	40	100
9	103304	Summer Training*	P	NA	NA	NA	1	60	40	100
Total No. of Credits				27						

*Institutional Training will be imparted in the Institute at the end of 2nd Semester for 6-weeks duration.
However this Subject is not applicable to LEET Students.

Semester: 4th										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	103401	Electromechanical Energy Conversion & DC Machines	T	3	1	0	4	50	50	100
2	103402	Power Plant Engineering	T	3	1	0	4	50	50	100
3	103403	Power System –I (Transmission and Distribution)	T	3	1	0	4	50	50	100
4	104401	Digital Electronics	T	3	1	0	4	50	50	100
5	104402	Electronic Devices & Circuits	T	3	1	0	4	50	50	100
6	104404	Linear Control Systems	T	3	1	0	4	50	50	100
7	103404	Electrical Machine Lab- I	P	0	0	2	1	60	40	100
8	104406	Control System Lab including MATLAB /SIMULINK simulations.	P	0	0	2	1	60	40	100
9	104407	Digital Electronics Lab	P	0	0	2	1	60	40	100
10	104408	Electronic Devices & Circuits Lab	P	0	0	2	1	60	40	100
Total No. of Credits				28						

Semester: 5th										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	103501	Asynchronous Machines	T	3	1	0	4	50	50	100
2	103502	Industrial Electronics	T	3	1	0	4	50	50	100
3	103504	Electric Drives	T	3	1	0	4	50	50	100
4	104403	Electro Magnetic Field Theory	T	3	1	0	4	50	50	100
5	104505	Microprocessor and its Applications	T	3	1	0	4	50	50	100
6	104502	Analog Electronics	T	3	1	0	4	50	50	100
7	102610	Java Lab	P	0	0	2	1	60	40	100
8	103505	Analog Electronics Lab	P	0	0	2	1	60	40	100
9	103506	Industrial Electronics and Drives LAB	P	0	0	2	1	60	40	100
10	103507	Industrial Training	P	NA	NA	NA	3	60	40	100
11	104509	Microprocessor and its Applications Lab	P	0	0	2	1	60	40	100
Total No. of Credits				31						

Semester: 6th										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	103601	Synchronous Machines	T	3	1	0	4	50	50	100
2	103602	Power System II (Switchgear & Protection)	T	3	1	0	4	50	50	100
3	103603	Generation of Electrical Power	T	3	1	0	4	50	50	100
4	103604	Programmable Logic Controllers & Microcontrollers	T	3	1	0	4	50	50	100
5	103605	Utilization of Electrical Energy and Traction	T	3	1	0	4	50	50	100
6	103606	Estimating and Costing in Power Systems	T	3	1	0	4	50	50	100
7	103607	Programmable Logic Controllers & Microcontrollers Lab	P	0	0	2	1	60	40	100
8	103608	Power system II Lab	P	0	0	2	1	60	40	100
9	103609	Minor Project Lab	P	0	0	2	1	60	40	100
10	103610	Electrical Machine –II Lab	P	0	0	2	1	60	40	100
Total No. of Credits				28						

Semester: 7th

Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
1	103701	6 Months Industrial Training	T/P	NA	NA	NA	20	500	500	1000
Total No. of Credits				20						

Semester: 8th										
Sr.	Subject Code	Subject Name	Type of Subject T/P	(Hours Per Week)			No. of Credits	Internal Marks	External Marks	Total Marks
				L	T	P				
2	103801	Computer Aided Power System Analysis	T	3	1	0	4	50	50	100
3	103802	Extra High Voltage Engg.	T	3	1	0	4	50	50	100
4	103803	Non-Linear & Digital Control Systems	T	3	1	0	4	50	50	100
		Elective-I	T	3	1	0	4	50	50	100
		Elective-II	T	3	1	0	4	50	50	100
10	103804	Computer Aided Power System Analysis Lab	P	0	0	2	1	60	40	100
11	103805	Major Project	P	0	0	4	2	60	40	100
12	103806	Seminar	P	0	0	2	1	100	100	200
Total No. of Credits				24						

Elective-I (Select one of the following subject)	
103807	High Voltage Direct Current Transmission
103808	Power System Planning
104601	Cellular & Mobile Communication
Elective-II (Select one of the following subject)	
102602	Human Resource Management
103809	Non- Conventional Energy Sources
105921	Total Quality Management

Note: This Study Scheme (less Semester-1 & Semester-2) is applicable to B. Tech EE LEET

Aneexure-2

Course Name: Communicative English

Course Code: 100101

Semester: 1st

	L T P
Credits: 03	**3 0 0**

Course Contents

UNIT - I

1. **Developing Habits of Independent and Fast Reading**

   Students will be required to read a prescribed prose. The essays in the anthology will be read by students at home with the help of glossary given in the book. Progressing from one lesson to another, they should learn to read fast. Students are supposed to keep a record of their reading in the form of notes, difficulties, summaries, outlines and reading time for each essay. Class teacher may use this record for awards of internal assessment (if any)

UNIT - II

1. **Developing Comprehension Skills**

   Teacher will provide guided comprehension of the prescribed texts in the class and help students in answering the questions given at the end of each lesson. Teacher can construct more questions of factual and inferential nature to enhance the comprehension skills of the students. The teacher shall also guide students to do the grammar exercise given at the end of each lesson.

2. **Developing skills in Personal Writing**

   Students will be required to learn short personal write-ups involving skills of description and narration. The types of composition task may include personal letter writing, telegram writing. Notice writing, diary writing etc. The teacher shall instruct the students about the appropriate

format and usual conventions followed in such writings. The teacher may also prescribe composition /writing book if so required.

UNIT - III

1. **Business writing:**

Business letters; elements of business writing; kinds of business letters – office order memorandum, report, purchase order, quotations and tenders, job application letters, personal resume and curriculum vitae etc.

UNIT - IV

1. **Development of Speaking Skills:** Public speaking – formal speaking-audience analysis – effective use of voice and body language – importance of confidence building – group discussion – presentation skills- seminar – interview skills development – telephone etiquettes – opinion based speaking.

References Books:

1. Vandana, R. S. (2006).*The Written Word*. Oxford University Press, New Delhi.
2. Samantaray, S. (2017). *Business Communication and Communicative English*. Sultan Chand, New Delhi.
3. Dhanavel, S.P. (2009). *English and Communication Skills for Students of Science and Engineering (with Audio CD)*. Orient Blackswan Pvt Ltd.
4. Gimson, A.C. (1971). *An Introduction to the Pronunciation of English*. ELBS
5. Bansal, R.K. & Harrison. (1991). *J.B. Spoken English*.Orient Longman, Hyderabad.
6. Sinclair J. E. (1990). *Collins Cobuild English Grammar Collins*. London : Collins.
7. Leena. Sen (2007). *Communication Skills*.Prentice Hall.

Course Name: Engineering Mathematics – I

Course Code: 100101

Semester: 1st

L T P

Credits: 05 **4 1 0**

Course Contents

UNIT - I

1. **Ordinary Differential Equations of first order**

Exact Differential equations, Equations reducible to exact form by integrating factors; Equations of the first order and higher degree.

UNIT - II

2. Linear Ordinary Differential Equations of second and higher order

Solution of linear Ordinary Differential Equations of second and higher order; methods of finding complementary functions and particular integrals. Special methods for finding particular integrals: Method of variation of parameters. Cauchy's homogeneous and Legendre's linear equation,

UNIT - III

3. Partial Derivatives:

Function of two or more variables; Partial differentiation; Homogeneous functions and Euler's theorem; Composite functions; Jacobians. Curvature of Cartesian curves; Curvature of parametric and polar curves.

4. Applications of partial differentiation:

Equation of tangent and normal to a surface; Taylor's and Maclaurin's series for a function of two variables; Errors and approximations; Maxima and minima of function of several variables.

UNIT - IV

5. Infinite Series:

Comparison test, Integral test, Ratio test, Rabee's test, Logarithmic test, Cauchy's root test. Convergence and absolute convergence of alternating series.

References Books:

1. Thomes, G.B. (1995). *Calculus and Analytic Geometry*. Addison Wesley.
2. Kreyszig. (1991). *Advanced Engineering Mathematics*. John Wiley.
3. Grewal, B.S. (2002).*Higher Engineering Mathematics*. Khanna Publishers New Delhi.
4. Babu, R. (2009).*Advance Engineering Mathematics*. Pearson Education.

Course Name: Engineering Physics

Course Code: 100104

Semester: 1st

L T P

Credits: 03 **3 1 0**

Course Contents

UNIT - I

1 Electrostatics and dielectrics:

Divergence and curl of a vector and their physical meaning, electric flux, Relation between electric field and potential, Charge distribution, Gauss law, Dielectric polarization, Types of polarization, Introduction to Maxwell equations and their importance, Equation of EM waves in

free space, Velocity of EM waves.

2 **Magnetic Materials and superconductivity**:

Basic ideas of Dia, Para, Ferro and ferri magnetic materials, Magnetic anisotropy, Magnetostriction, Introduction to superconductors, Critical temp, Critical field, Type1 and type2 superconductors, Meissner effect, B.C.S theory of superconductivity, Londons equations.

UNIT - II

3 Laser:

Spontaneous and stimulated emission, Einstien coefficient, Population inversion, pumping, Components of laser, Three level and Four level laser, Ruby laser, He-Ne laser, Semiconductor laser, Holography.

4 **Optical Fibre communication**:

Introduction, Optical communication (block diagram), Optical fiber physical structure, Basic theory of propagation of light, Modes of propagation, Acceptance angle, Numerical aperture, Normalized frequency, Losses in optical fibre, (scattering losses, Macro bending and Micro bending losses, material and pulse dispersion), Fiber connectors, Splices, Couplers, Applications of optical fibre.

UNIT - III

5 Theory of relativity:

Concept of ether, Michelson Morley experiment, Einstiens postulates of theory of relativity, Gallilian transformation, Lorentz transformation equations, Length contraction, Time dilation, Simultaneity in relativity, Variation of mass with velocity, Mass energy and Energy momentum relation.

6 Modern physics:

Need of quantum theory, Wave particle duality, De Broglie concept, Wave and gp velocity, Heisenberg uncertainty principle and its applications (particle in a box), normalization wave function, Orthogonal wave function, Schrodinger wave equation, applications of S.W.E Particle in a box, eigen value, eigen function.

UNIT - IV

7 Elements of crystallography:

Unit cell, Basis, Space lattice, Crystal system, Introduction, Production of x rays, Hard and soft x rays, Continuous and characteristic x rays, Braggs law in crystals, Absorption of x rays.

8 Nanophysics:

Nanoscale, Surface to volume ratio, Electron confinement, Nanoparticles, nanomaterials, Unusual properties of nano-materials, Synthesis of nanomaterials, Ball milling and sol-gel techniques,

Carbon nano tubes, Applications of nanomaterials.

References Books:

1. Griffths, D.J. (1999). *Introduction to Electrodynamics*. Prentice Hall.
2. Singh, R.B. (2010) .*Introduction to Modern Physics*. New Age Internationals.
3. Dogra, R. (2011). *Essentials of Physics*. S.K. Kataria and Sons.
4. Kittle, C. (1951). *Solid State Physics*. John Wiley and Sons Inc

Course Name: Fundamentals of Computer Programming and Information Technology

Course Code: 102101

Semester: 1st

L T P

Credits: 03 **3 0 0**

Course Contents

UNIT - I

1. **Introduction to Computers**

   Define a Computer System, Block diagram of a Computer System and its working, Associated peripherals, Memories, RAM, ROM, Secondary storage devices, Computer Software and Hardware.

2. **Working Knowledge of Computer System**

   Introduction to the operating system, Its functions and types, Working knowledge of GUI based operating system, Introduction to word processors and its features, Creating, Editing, Printing and saving documents, Spell check, Mail merge, Creating power point presentations, Creating spreadsheets and simple graphs, Evolution of Internet and its applications and services.

3. **Problem Solving and Program Planning**

   Need for problem solving and planning a program; program design tools – algorithms, flow charts, and pseudo code; illustrative examples.

UNIT - II

4. **Overview of C++ Language**

   Introduction to C++ language, Structure of a C++ program, Concepts of compiling and linking, IDE and its features; Basic terminology - Character set, Tokens, identifiers, Keywords, Fundamental data types, Literal and symbolic constants, Declaring variables, Initializing variables,

Type modifiers, Operators in C++, precedence and associatively of operators, Expressions and their evaluation, Type conversions.

5. **Beginning with C++ program**

   Input / output using extraction (>>) and insertion (<<) operators, Writing simple C++ programs, Comments in C++**,** Stages of program execution.

6. **Control Structures**

   Decision making statements: If, Nested if, If – else. Else if ladder, Switch, Loops and iteration: While loop, For loop, Do – while loop, Nesting of loops, Break statement, Continue statement, Go to statement, Use of control structures through illustrative programming examples.

UNIT - III

7. **Functions**

   Advantages of using functions, Structure of a function, Declaring and defining functions, Return statement, Formal and actual arguments, Const argument, Default arguments, Concept of reference variable, Call by value, Call by reference, Library functions, recursion, Storage classes. Use of functions through illustrative programming examples.

8. **Arrays and Strings**

   Declaration of arrays, Initialization of array, Accessing elements of array, I/O of arrays, Passing arrays as arguments to a function, Multidimensional arrays. String as array of characters, Initializing string variables, I / O of strings, String manipulation functions (strlen, strcat, strcpy, strcmp), Passing strings to a function. Use of arrays and strings through illustrative programming examples.

9. **Concepts of Object Oriented Programming**

   Introduction to Classes, Objects, Data abstraction, Data encapsulation, Inheritance and polymorphism.

UNIT - IV

10. **Classes and Objects**

    Defining classes and declaring objects, Public and private keywords, Constructors and destructors, Defining member functions inside and outside of a class, Accessing members of a class, Friend function. Use of classes and objects through illustrative programming examples.

11. **Basics of File Handling**

    Opening, reading, and writing of files, Error handling during files operation

References Books:

1. Balaguruswamy, E. (2008). *Object-Oriented Programming with C++*. Tata McGraw Hill.
2. Sinha, P. K. & Sinha, P. (2010). *Computer Fundamentals*. BPB Publications.
3. Lafore, R. (1995). *Object Oriented Programming in C++*. Waite Group.
4. Stroustrup, B. (2011). *The C++ Programming Language.* Addison Wesley.
5. Lippman, F. B. (2012). *C++ Primer*. Addison Wesley.

Course Name: BASIC ELECTRONICS & COMMUNICATION ENGINEERING
Course Code: 104101
Semester: 1st

Credit:- 04 **L T P**

3 1 0

COURSE OBJECTIVE:-

This subject gives a basic knowledge of electronic circuits, Transducers, Semiconductor devices with which a building of innovative technology can be created. The students are expected to learn and understand the importance and application of electronic materials. This knowledge gives them a brief outline of the fundamentals that would be the foundation of today and tomorrow.

COURSE CONTENTS:-

1. **Semiconductors, Diodes and Diode Circuits**

   Insulators, Semiconductors and metals, Mobility and conductivity, Intrinsic and extrinsic semiconductors and charge densities in semiconductors, Current components in semiconductors, Continuity equation. PN Junction diode- characteristics and analysis, Types of diodes – Zener diodes, Photodiodes, Light emitting diodes (LEDs), Varactor diodes and tunnel diodes. Rectifiers and filter circuits: Half wave, Full wave and Bridge rectifier circuits and their analysis, L, C and Pi filters, Basic regulator supply using zener diode. Working of Switched Mode Power Supply.

2. **Electronic Instruments**

Role and importance of general purpose test instruments, Electronic Multimeter, Cathode Ray Oscilloscope, Measurement of amplitude, Frequency and phase using CRO. Introduction and application of Digital Multimeter.

3. **Transistors:**

   Construction and characteristics of bipolar junction transistors (BJTs)- Comm. Base, Comm. Emitter and communication, Collector configuration, Transistor biasing.

4. **Field Effect Transistor**

   Construction and characteristics of JFET, Biasing circuit, JFET amplifier, MOSFET construction and characteristics.

5. **Amplifiers and Oscillators**

   Classification of amplifiers, Concept of feedback, General characteristics of feedback amplifiers, Single stage RC coupled amplifier. Basic principle of Oscillators, Tank & crystal circuit.

6. **Operational Amplifiers**

   Introduction to Op-amp, Inverting and non-inverting configuration.

7. **Basic Communication System**

   Fundamentals of Communication system.

8. **Digital Electronics**

   Binary, Octal and Hexadecimal number system & their arithmetic operation, Logic gates, Introduction of R-S, J-K, D and T Flip Flops and their truth tables.

9. **Transducers**

   Introduction, working and applications of LVDT, Strain Gauge and Thermistor,

Recommended Books

1. Basic Electrical and Electronics and Computer Engg. by R Muthusubramanian, S. Salivahanan, K.A. Muraleedharan; Tata McGraw Hill
2. A Text Book of Electrical Tech. by B.L. Theraja & A.K. Theraja; S. Chand.

3. A Course in Electrical and Electronics Measurements & Instrumentation by A.K. Sawhney; Dhanpat Rai & Co.
4. Basic Electrical and Electronics Engg. by J.B. Gupta
5. Basic Electronics Engg. and Linear Circuits by N.N. Bhargave
6. Basic Electrical and Electronics Engg. by S.K. Sahdev (Unique International Publication)

Course Name: FUNDAMENTALS OF COMPUTER PROGRAMMING & INFORMATION TECHNOLOGY LAB

Course Code: 102102

Semester: 1st

Credit: - 02 **L T P**

0 0 4

COURSE CONTENTS:

1. Familiarization with the Computer System:

a) To explain the part of the computer system such as system unit, input devices, output devices connected to the computer.
b) To explore the outside view of the system unit that includes the panels on front and ports at the rear
c) To explore the inside view of the system unit that includes the motherboard, processor, expansion slots, various add-on cards, storage devices, power supply, fans.
d) To understand the booting process that includes switching on the system, execution of POST routine, then bootstrap loader, and loading of the operating system, and getting it ready for use.
e) To introduce the graphical user interface (desktop) of Windows operating system
   I. to explain the various elements of the desktop such as taskbar, icons (My Computer, Recycle Bin, etc.), short cuts, notification area.
   II. To configure the desktop that includes selecting the wall paper, selecting the screen saver with or without password protection, selecting the screen resolution and color quality.

2. Navigating with Window Explorer:

a) To navigate with the drives
b) To create new folders
c) To move folders from one drive to another drive
d) To move files from one folder to another folder
e) To search files and folders
f) To share files and folders

g) To view and/or change the attributes of the files and folders

3. Working with Control Panel:

   a) To work with date and time
   b) To create new user accounts
   c) To install new hardware and configuring existing hardware
   d) To install new software or remove existing installed software
   e) To configure network connections
   f) To manage security profile

4. Miscellaneous Features:

   a) To work at the command prompt
   b) To open an application, folder, document or internet resource from the Run command
   c) To initialize storage media (formatting)
   d) To understand the menace of viruses
   e) To understand the working of virus guards and antivirus software

5. Exploring the Internet:

   a) To understand the working of the internet that include the use of protocols, domains, IP addresses, URLs, web browsers, web servers, mail-servers, etc.
   b) To create email-account, sending mails, receiving mails, sending files as attachments, etc.
   c) To login to a remote computer
   d) To search information using search engines

6. Microsoft Word:

   a) To familiarize with parts of Word window
   b) To create and save a document
   c) To set page settings, create headers and footers
   d) To edit a document and resave it
   e) To use copy, cut and paste features
   f) To use various formatting features such as bold face, italicize, underline, subscript, superscript, line spacing, etc.
   g) To use spelling and grammar checking feature
   h) To preview print a document

7. Microsoft Word continued:

   a) To create a table with specified rows and columns
   b) To enter data in a table
   c) To select a table, a row, a column or a cell
   d) To insert new row and/or a column
   e) To delete a row and/or a column
   f) To split and merge a row, column or a cell
   g) To understand the mail-merge and to use mail merge feature of MS-Word

8. Microsoft Excel:

   a) To familiarize with parts of Excel window
   b) To create and save a workbook with single and/or multiple worksheets

c) To edit and format text as well as numbers
d) To apply operations on range of cells using built-in formula
e) To preview and print a worksheet

9. Microsoft Excel continued:

a) To insert new row and/or column in a worksheet
b) To delete a row and/or column in a worksheet
c) To create a variety of charts
d) To import and export data to or from worksheet

10. Microsoft PowerPoint:

a) To familiarize with parts of PowerPoint window
b) To create and save a new presentation
c) To apply design templates to a presentation
d) To insert, edit and delete a slide
e) To use different views of slides
f) To use slide show from beginning or from the current slide
g) To preview and print a presentation

11. Microsoft PowerPoint continued:

a) To check spellings in a presentation
b) To add clip art and pictures in a slide
c) To add chart, diagram and table in a slide
d) To set animation for a selected slide and/or for entire presentation
e) To create slide master and title master
f) To create a custom show

1. Write a program to find the nature of the roots as well as value of the roots. However, in case of imaginary roots, find the real part and imaginary part separately.
2. Write a program, which takes two integer operands and one operator form user, performs the operation and then prints the result. (Consider the operators +,-,*, /, % and use switch statement).For example, the input should be in the form: 5 + 3 the output should come Result = 8
3. Fibonacci sequence is defined as follows: the first and second terms in the sequence are 0 and 1. Subsequent terms are found by adding the preceding two terms in the sequence. Write a program to generate the first n terms of the sequence. For example, for n = 8, the output should be 0 1 1 2 3 5 8 13
4. Write a program to print all the prime numbers between m and n, where the value of m and n is supplied by the user.
5. The number such as 1991, is a palindrome because it is same number when read forward or backward. Write a program to check whether the given number is palindrome or not.
6. A positive integer number IJK is said to be well-ordered if I<J<K. For example, number 138 is called well-ordered because the digits in the number (1, 3, 8) increase from left to right, i.e., 1 < 3 < 8. Number 365 is not well-ordered because 6 is larger than 5. Write a program that will find and display all possible three digit well-ordered numbers. The program should also display the total number of three digit well-ordered numbers found.
7. Write a function to computer the highest common factor of integer numbers m and n. Use this function to find the highest common factor of integer numbers a and b.
8. Given the marks (out of 100) obtained by each student in a test of a class with n students. Write a program to obtain the following information:
   a) minimum and maximum marks scored

b) average score of the class, and
c) number of students whose score is greater than class's average score

20. Write a program to multiply matrix $A_{m\times n}$ by $B_{p\times q}$, given that n = p.

21. Write a program to sort a list of n integer numbers in ascending order using bubble sort method.

22. Create a class named Student with the appropriate data members and member functions to generate output comprising student's admission no., name, marks in five subjects and the %age of marks obtained. Write a program to use the Student class.

23. Create a class named Complex Number with the appropriate data members and constructors. Include member functions (defined inside the class) to perform the following operations:

    a) Inputting a complex number
    b) Outputting a complex number
    c) Arithmetic operations on two complex numbers

    Write an appropriate program to demonstrate use of the Complex Number class.

24. Create a class named Height with feet and inches as its data members. Also include appropriate constructors (and destructor, if required). Include member functions (defined outside the class) to perform the following operations:

    a) Inputting a height of a person
    b) Displaying a height of a person
    c) To get height in inches
    d) To compare two heights

    Write an appropriate program to demonstrate use of the Height class.

Note: Students are required to prepare a file containing lab exercises based on programming only, where as the oral examination will from the entire syllabus.

Course Name: ENGINEERING PHYSICS LABORATORY (100107)

Semester: 1st

Credit: -01 **Course Code: 100107** **L T P**

0 0 2

COURSE CONTENTS:

1. To study the magnetic field of a circular coil carrying current.
2. To find out polarizability of a dielectric substance.
3. To study the laser beam characteristics like, wave length using diffraction grating aperture & divergence.
4. To study laser interference using Michelsons Interferometer.
5. Study of diffraction using laser beam and thus to determine the grating element.
6. To determine numerical aperture of an optical fibre.
7. To determine attenuation & propagation losses in optical fibres.
8. To find out the frequency of AC mains using electric-vibrator.
9. To find the refractive index of a material using spectrometer.
10. To find the refractive index of a liquid.
11. To study B-H curve using CRO.
12. To find the velocity of ultrasound in liquid.
13. To determine the grain size of a material using optical microscope.

Note: Each student is required to perform at least ten experiments

Suggested Readings / Books

1. Practical Physics, C.L. Arora; S. Chand & Co.
2. Practical Physics, R.S. Sirohi; Wiley Eastern.

Course Name: COMMUNICATIVE ENGLISH LABORATORY

Semester: 1st

Credit :- 01 **Course Code: 100105** **L T P**

0 0 2

COURSE CONTENTS:

Lab Exercises

Listening and Speaking

The audio CD accompanying S.P. Dhanavel's book shall be played in the lab to get the students familiar with the standard spoken English. The students must develop a high degree of understanding of spoken

material as used in academic and professional environment. The teacher shall help them in the following:

a) With the accent of the speaker if it is unfamiliar to them.

b) The Standard English sounds and pronunciation of words.

c) With the topical vocabulary and the idiomatic expressions which are generally part of colloquial speech.

d) With the implied relationships in larger texts, if they are not stated explicitly.

In addition to the above, extended listening sessions shall be arranged to promote speaking activities among students. For this purpose, a set of twin books (K. Sadanand and S. Punitha Spoken English Part I and II, A Foundation Course (with audio CD), Orient Blackswan), is prescribed for use. The teachers shall play the CDs selectively in the lab and involve the students in the practice work based on them. While taking up lessons, the teacher must promote the use of dictionaries for correct pronunciation and give example practice on word stress and weak forms.

The students are also supposed to supplement their listening practice by regularly viewing news/knowledge channels on the TV or lecture videos on the internet.

At the end of a session, a good speaker must:

a) Be able to produce long turns without much hesitation in an accent that is understood all around.

b) Have ready access to a large lexis and conventional expressions to speak fluently on a variety of topics.

c) Have a knack for structured conversation or talk to make his transitions clear and natural to his listeners.

The teacher may use following different classroom techniques to give practice and monitor the progress of the students:

(a) role play

(b) question-answer

(c) discussion

(d) presentation of papers

(e) seminars

Course Name: Basic Electronics and Communication Engineering Lab

Course Code: 104102

Semester: 1st

L T P

Credits: 01 **0 0 2**

Course Contents

1. Familiarization of electronics component and equipments like C.R.O., Function Generator and power supplies etc.
2. To study the V-I characteristics of PN-Junction diode and determine static resistance and dynamic resistance.
3. To study the characteristics of zener diode and hence determine the dynamic resistance form the characteristics
4. Determine the voltage regulation of zener diode stabilizer.
5. To study and plot the wave form of half wave and full wave rectifier with and without capacitor filter.
6. To study and plot the input and output characteristics of common emitter transistor and calculate its input and output resistance.
7. To study and plot the input and output characteristics of common base transistor and calculate its input and output resistance.
8. To study the characteristics of FET (Field effect transistor) and hence calculate dynamic (r_d), mutual conductance (g_m) and amplification factor.
9. To study the frequency response of single stage CE amplifier and hence calculate the band width (1dbBW).
10. To study the transistor response.
11. To analysis the truth tables of various basic digital gates.

Course Name: Manufacturing Practices

Course Code: 105104

Semester: 1st

L T P

Credits: 03 **0 0 6**

Course Contents

UNIT - I

1. **Carpentry and Pattern Making:**
   Various types of timber and practice boards, Defects in timber, Seasoning of wood; tools, Wood operation and various joints; Exercises involving use of important carpentry tools to practice various operations and making joints.
2. **Foundry Shop:**
   Introduction to moulding materials; Moulds; Use of cores; Melting furnaces; Tools and equipment used in foundry shops; Firing of a cupola furnace; Exercises involving preparation

of small sand moulds and castings.

UNIT - II

3. **Forging Practice:**
   Introduction to forging tools; Equipments and operations; Forgeability of metals; Exercises on simple smithy; Forging exercises.
4. **Machine Shop:**
   Machines, Grinders etc; Cutting tools and operations; Exercises involving awareness.

UNIT - III

5. **Welding Shop:**
   Introduction to different welding methods; Welding equipment; Electrodes; Welding joints; Welding defects; Exercises involving use of gas / electric arc welding.
6. **Electrical and Electronics Shop:**
   Introduction to electrical wiring; Preparation of PCBs involving soldering applied to electrical and electronic applications; Exercises preparation of PCBs involving soldering applied to electrical and electronic applications.

UNIT - IV

7. **Sheet Metal:**
   Shop development of surfaces of various objects; Sheet metal forming and joining operations, Joints, Soldering and brazing; Exercises involving use of sheet metal forming operations for small joints.
8. **Fitting Shop:**
   Introduction of fitting practice and tools used in fitting shop; Exercise involving marking, Cutting, Fitting practice (Right Angles), Male-Female mating parts practice, trapping practice.

References Books: -

1. Raghuwanshi, B.S. (2009*). A Course in Workshop Technology, Vol 1 and II*. Dhanpat Rai and Sons.
2. Jain, R.K. (2010*). Production Technology*. Khanna Publishers.
3. Singh, S. (2001).*Manufacturing Practice*. SK Kataria and Sons.

Course Name: Engineering Chemistry

Course Code: 100102

Semester: 2nd

L T P

Credits: 05 **4 1 0**

Course Contents

UNIT - I

1. **Spectroscopy and its Applications:**
   An introduction UV / Visible Spectroscopy: Selection rules; Line widths and intensity of spectral lines; Principle and instrumentation; Electronic Transitions; Chromophores and auxochromes; Factors affecting λ_{Max} and intensity of spectral lines; Franck-Condon principle; Applications.IR Spectroscopy: Principle and instrumentation; Vibrational frequency; Fundamental modes of vibrations and types; Anharmonics; Factors affecting vibrational frequency; Applications.NMR Spectroscopy: Principle and instrumentation; Chemical shift; Spin-Spin Splitting; High resolution NMR spectrum (PMR only).
2. **Photochemistry:**
   Introduction; Photo-physical and photochemical processes; Light sources in photochemistry; Beer-Lambert Law; Laws of Photochemistry; Quantum yield (primary and overall); Primary and secondary photochemical reactions; Jablonski diagram, Photovoltaic cells.

UNIT - II

3. **Water and its Treatment:**
   Boiler feed water: Boiler feed problems; Specification, Scales and sludge formation; Priming and foaming; Caustic embrittlement; Boiler corrosion; Different methods of the water purifications and softening; Desalination of water; Water for domestic use: Specification; Disinfection of water.
4. **Green Chemistry and its Applications:**
   Introductory overview – Definition and concepts of Green chemistry; Emergence of Green chemistry; Twelve principles of Green Chemistry with emphasis on the use of alternative feedstock (bio-fuels); Use of innocuous reagents in natural processes; Alternative solvents; Design of safer chemicals; Designing alternative reaction methodology, Minimizing energy consumption.

UNIT - III

5. **Corrosion and its Prevention:**
   Introduction; Different types of corrosion – Wet, Dry corrosion and other forms of corrosion; Mechanisms of wet corrosion; various methods of corrosion control.
6. **Catalysis and Polymers:**
   Introduction; Catalysis and general characteristics of catalytic reactions; Homogenous catalysis; Enzyme catalysis including their mechanism; Classification of polymers; Mechanism of addition and condensation polymerization; Phenol formaldehyde resin; Urea formaldehyde resin.

UNIT - IV

7. **Nanochemistry:**
   Introduction; Materials self-assembly; Molecular vs. materials self-assembly; Self- assembling materials; Two dimensional assemblies; Mesoscale self assembly; Nanoscale materials; Future perspectives, Nanocrystals.
8. **Petrochemicals:**
   Introduction; First, second and third generation petrochemicals; Primary Raw Materials for Petrochemicals. Natural gas: Natural gas treatment processes; Natural gas liquids; Properties of natural gas; Crude oil: Composition of crude oil- Hydrocarbon compounds, Non-hydrocarbon compounds, Production of ethylene and propylene. Metallic crystals, Crude oil classification, Physical separation processes, Conversion processes.

References Books:

1. Kemp, W. (1991). *Organic Spectroscopy*. Palgrave Foundations.
2. Skoog, D. A., Holler, F. J., & Timothy, A. N. (1998). *Principles of Instrumental Analysis (*5th Edition). Saunders College Publishing. Philadelphia.
3. Castellan G. W. (1995). *Physical Chemistry*. Saunders College Publishing. Philadelphia.
4. Poole C. P., & Owens, F. J. (2003). *Introduction to Nanotechnology*. Wiley Interscience.
5. Foster L.E. (2007). *Nanotechnology, Science Innovation and Opportunity*. Pearson Education.

Course Name: Engineering Mathematics – II

Course Code: 100201

Semester: 2nd

	L T P
Credits: 05	**4 1 0**

Course Contents

UNIT - I

1. **Matrices:**

Linear dependence of vectors and rank of matrices. Elementary transformation, Gauss- Jordan method to find inverse of a matrix, Consistency and solution of algebraic equations, Linear transformations, Eigen values, Eigen Vectors, Cayley Hamilton Theorem,

UNIT - II

2. **Integral Calculus:**

Rectification of standard curves; Areas bounded by standard curves; Volumes and surfaces of revolution of curves. **D**ouble and triple integration, Change of order of integration, Change of variable. Application of double integration to find areas. Application of double and triple integration to find volumes, Beta and gamma functions.

UNIT - III

3. **Application of Vector Calculus:**

Flux, Solenoid and irrotational vectors. Gauss Divergence theorem. Green's theorem in plane. Stoke's theorem.

Statistics:

Discrete and continuous probability distributions. Binomial, Poisson and Normal distribution.

UNIT - IV

4. Complex Numbers:

De-Moivre's theorem and applications, Exponential and logarithmic complex functions, Circular and hyperbolic functions of complex variables, Summation of trigonometric series.

References Books:

1. Thomes, G.B. & Finney, R.L. (1995). *Calculus and Analytic Gemetry*. Ninth Edition; Addition Wesley
2. Kreyszig, E. (1998). *Advanced Engineering Mathematics*. Eighth Edition; John wiley.
3. Grewal, B.S. (1965). *Higher Engineering Mathematics*. Khanna Publishers, New Delhi.
4. Ram, B. (2009). *Advance engineering Mathematics*. Pearson Education.

Course Name: Basic Electrical Engineering

Course Code: 103101

Semester: 2nd

	L T P
Credits: 05	**4 1 0**

Course Contents

UNIT - I

1. DC Network Theorems

Circuit elements and related terminology, Illustration and Limitations of ohm's Law , Kirchhoff's Laws statements and Illustration, Method of solving circuits by Kirchhoff's Laws, Star-Delta conversions, Computation of resistance in constant temperature, Resistance at different temperatures, Units, Work, Power and Energy (Electrical, Thermal and Mechanical) DC transients –for R-L and R-C series circuits.

Theorems

Thevenin's theorem, Superposition theorem, Norton Theorem, Maximum Power transfer theorem, Reciprocity theorem,

UNIT - II

2. AC Fundamental

Production of alternating voltage, Waveforms, Average and RMS values, Peak factor, form factor,

Phase and phase difference, Phasor representation of alternating quantities, Phasor diagram, Behavior of AC series, Parallel and series parallel circuits, Power factor, Power in AC circuit, Effect of frequency variation in RLC series and parallel circuit, Q factor, Band width of resonant circuit.

3. **Electromagnetism**

Magnetic circuits, Analogous quantities in magnetic and electric circuits, Faradays' law, self and mutual inductance, Energy stored in magnetic field, Hysteresis and Eddy current losses, and Electromechanical Energy conversion

UNIT - III

4. **DC Machines**

Construction, Types of armatures winding (Lap and wave)

DC generator: Principle of operation, EMF equation, Applications.

DC motors: Principle of operation, Speed-torque Characteristics (shunt and series machine).

UNIT - IV

5. **Single Phase Transformer**

Principle of Operation, Construction, EMF equation, Losses of a transformer, Open and short circuit tests and efficiency.

6. **Three Phase Induction Motor**

Types, Construction, Production of rotating field, Principle of operation, Applications.

References Books:

1. Muthusbramanian, R. S., Salivahanan, K.A., & Muraleedharan. (1899). *Basic Electrical and Electronics and Computer Engg.* Tata Mcgraw-Hill.
2. Theraja, B.L. & A.K. Theraja.(1959). *A Text Book of Electrical Tech*. Twenty Third Edition; S. Chand.
3. Deltoro, Vincent. (1989). *Fundamentals of Electrical Engg*. Prentice Hall.
4. Sawhney, A.K. (2012). *A Course in Electrical and Electronics Measurements and Instrumentation*. Dhanpat Rai and Co.

Course Name: Elements of Mechanical Engineering

Course Code: 105101

Semester: 2nd

L T P

Credits: 05 **4 1 0**

Course Contents

UNIT - I

1. **Fundamentals of Thermodynamics:**

   Definition, Concept of thermodynamic system, boundary and surroundings, Type of System Open, Closed and isolated systems, State, Property, Process and cycle, Reversible, Quasi-static and irreversible processes and conditions for reversibility, Energy and its forms energy transfer across system boundaries, Heat and work, property and energy as point and path functions, Ideal gas and characteristic gas equation, Zeroth law of thermodynamics, Concept of thermal equilibrium and principle ofthermometry.

2. **First Law of Thermodynamics and Its Applications:**

   Essence and corollaries of the first law, Analytical expressions applicable to a process and cycle internal energy, Enthalpy and specific heats first law analysis of steady flow, applications of steady flow energy equation to various engineering devices, Closed and open systems, Analysis of non-flow (Close System) and flow (Open System) processes for an ideal gas under constant volume (Isochoric), Constant pressure (Iso baric), Constant temperature (Isothermal), Adiabatic and polytropic conditions, Analysis of free expansion and throttling processes.

UNIT - II

3. **Second Law of Thermodynamics:**

   Limitations of first law, Need of second law of thermodynamics, Various statements of second law and their equivalence, Applications of statements of second law to heat engine, Heat pump and refrigerator, Philosophy of Carnot cycle and its consequences, Carnot theorem for Heat engines and heat pump, Claussius inequality, Concept and; philosophy of entropy and entropy changes during various processes, Temperature entropy chart and representation of various processes on it.

4. **Gas Power Cycles:**

   Concept and philosophy of Air Standard Cycle and Air standard Efficiency, Some basic definitions of Piston-Cylinder arrangement, Working of Otto cycle, Diesel cycle, Dual cycle and Brayton cycle their representation on P-V and T-S Charts, Comparison of Otto cycle, Diesel cycle, Dual cycles, Mean Effective Pressure, Introduction to constructional features and working of two stroke and four stroke petrol and diesel engines and their comparison.

UNIT - III

5. **Classification of Engineering Materials:**

   Introduction Materials and Engineering, Classification of Engineering Materials, Significance of various Mechanical Properties of Materials e.g., Elasticity, Plasticity, strength, Ductility, Brittleness, Malleability, Toughness, Resilience hardness, Mach inability, Formability, Weld

ability, Properties, Composition, and Industrial Applications of materials metals (ferrous- cast iron, tool steels, stainless steels and non ferrous- Aluminum, brass, bronze), Polymers (natural and synthetic, thermoplastic and thermosetting), Ceramics (glass, optical fibre glass, cements), Composites (fibre reinforced, metal matrix), Smart materials (piezoelectric, shape memory, Thermo chromic, Photo chromic, Magneto rheological), Conductors, Semi-conductors and Insulators, Organic and Inorganic materials, Selection of materials for engineering applications.

UNIT - IV

6. Mechanics of Solids:

Concept of stress strain curve, Yield point, Elastic limit, Ductility, Elongation, True stress and true strain, Strain energy and resilience, Tension, Compression, Torsion, Bending, Hardness, Fatigue, Creep, Impact, Concept and philosophy of stress and strain, Normal, Shear and Temperature stresses longitudinal and lateral strain, Poisson's ration, Sudden and impact load, Stresses in composite bar due to application of load and temperature, Elastic constants and their significance , Relations between Elastic constants (Without Proof); Young modulus of Elasticity, Poisson's ratio, Modulus of rigidity, and Bulk modulus, Moment of inertia and centre of gravity of section I,T and C.

References Books:

1. Nag, P.K. (2005). *Engineering Thermodynamics*. Tata McGraw Hill.
2. Yadav, R. (2002). *Thermodynamics and Heat Engines*. Central Publishing House.
3. Rogers, G. & Mayhew, Y.(2002).*Engineering Thermodynamics*. Pearson Education.
4. Rao, Y.V.C.(2003) .*An Introduction to Thermodynamics*. New Age International (P) Limited.
5. Cengel, Y.A. & Boles, M.A.(2011) .*Thermodynamics – An Engineering Approach*. Tata McGraw Hill.
6. Singh, S. (2016). *Strength of materials*. Khanna Publishers.

Course Name: Engineering Graphics and Drawing

Course Code: 105102

Semester: 2nd

L T P

Credits: 05 **4 1 0**

Course Contents

UNIT – I

1. Basic Concepts of Drawing and Projections:

Various types of lines, Principles of dimensioning, Size and location dimensions, Symbols, Conventions, Scales (plane and diagonal) and lettering as per IS code of practice (SP-46) for general Engg. Drawing. Exercises on lettering techniques free hand; Printing of letters and numerals in 3,5,8 and 12mm sizes, Vertical and inclined at 75^o Instrumental lettering in single stroke. Relevance of projection, Type of projections, Perspective, Orthographic, Axonometric and their basic principles, System of orthographic projection: in reference to quadrants and octants, Illustration through simple problems of projection.

UNIT – II

2. **Projection of Points:**

   Different methods of angle of projections; Projection of points on Plane and projection of point on Auxiliary planes.

3. **Projection of Lines:**

   Projection of lines, True lengths of lines and their horizontal and vertical traces. Rotation method and auxiliary plane method and traces of line.

4. **Projection of Planes:**

   Difference between plane and lamina. Projection of lamina Parallel to one and perpendicular to other, Perpendicular to one and inclined to other, Inclined to both reference planes and Lamina oblique to three reference planes. Application of auxiliary planes, and trace of planes.

UNIT – III

5. **Projection of Solids:**

   Definition of solids, Types of solids: Right and oblique solids; solids of revolution and polyhedrons etc. and their auxiliary views. Visible and invisible details in the projection. Use rotation and auxiliary plane method to draw the projections.

6. **Section of Solids:**

   Definition of Sectioning and its purpose. Principle and Procedure of Sectioning, Types of sectional planes. Illustration through their practice on projection of solids, sectioning by auxiliary planes.

7. **Intersection of Surfaces/Solids:**

   Purpose of intersection of surfaces, Intersection between the two cylinder, Two prisms, Prism and pyramid, Pyramid and pyramid, Cylinder and prism, Cone and cylinder, Sphere and cylinder etc., Use of cutting plane and line method.

8. **Development of Surface:**

   Concept of development, Parallel line, Radial line and triangulation method. Development of

prism, Cylinder, Cone and pyramid surface for both right angled and oblique solids and development of unique surfaces like hopper, Tray, sphere etc.

UNIT – IV

9. **Isometric Projection:**

Classification of pictorial views, Basic Principle of Isometric projection, Difference between isometric projection and isometric drawing. Isometric projection of solids.

10. **Orthographic Projection:**

Concept of Orthographic Projection, Drawing missing lines and missing view in orthographic projections. Interpretation of production drawings.

References Books:

1. Gill, P.S. (2001). *Engineering Drawing*. S.K; Kataria and Sons, Ludhiana.
2. Bhatt, N.D. (2012). *Engineering Drawing*. Charotar Book Stall, Tulsi Sadan, Anand.
3. French, T.E. & Vierck, C.J.(1993). *Graphic Science*. McGraw-Hill, New York.
4. Zozzora, F. (1958).*Engineering Drawing*. McGraw Hill, New York.

Course Name: Engineering Chemistry Laboratory

Course Code: 100106

Semester: 1st

	L T P
Credits: 01	**0 0 2**

Course Contents

1. **Analysis of Effluents**
   a) Determination of water by EDTA method.
   b) Determination of H_2O by dissolved oxygen analyzer.
   c) Determination of turbidity by Nephelometer
   d) Determination of Residual Chlorine.
2. **Analysis of Fuels and Lubricants**
   a) Determination of Moisture, Volatile and ash content by proximate analysis.
   b) Determination of Flash and Fire point by Abee‟s Apparatus
   c) Determination of the viscosity.
   d) Determination of Acid Value and Aniline point of oil

e) Determination of refractive index for oils.

3. Instrumental Analysis

a) Determination λ-max by spectrophotometer and determination of unknown conc of binary mixture of two liquids.

b) Determination of the surface tension by stalagmometer.

c) Determination of the concentration of a solution conductometerically.

d) Determination of the strength of a solution pH meterically.

e) Distinction between acid, ester, ketone using IR spectrophotometer.

f) Determination of bathochromic shifts, hypsochromic and hyperchromic, hypochromic shift of benzene and its derivatives

4. Chromatography

a) Determination of Rf value of amino acid by TLC and identification of the amino acid present.

b) Separation of metallic ions by paper chromatography. Separation of Ions by using complexing agents

c) Separation of plant pigments, Chlorophyll and carotenoids by column chromatography.

d) Determination of the ion exchange capacity of the given ion exchanger.

e) Separation of ions by ion-exchange method.

5. Synthesis and Green Chemistry experiments

a) Preparation of a polymer phenol/urea formaldehyde resin or hexamethylenediamine adipic acid polymer and determination of carbonyl value or acid value.

b) Preparation of aspirin.

c) Preparation of ethyl-2-cyano-3-(4‟-methoxyphenyl)-propeonate (Microwave assisted reaction)

d) Base catalyzed aldol condensation by Green Methodology

e) Acetylation of primary amines using ecofriendly method.

Note: Each student is required to perform two experiments from each of the 5 titles (presented bold) depending on his/her Branch and Aptitude.

References Books:

1. Vogel, A.I.. (1980). *Quantitative Inorganic Analysis*. Oxford ELBS.
2. Vogel, A.I.. (1987). *Quantitative Organic Analysis*. Oxford ELBS.

Course Name: Basic Electrical Engineering Lab

Course Code: 103102

Semester: 2nd

L T P

Credits: 01 **0 0 2**

Course Contents

List of Experiments:

1. To verify ohm's law.
2. To find voltage and current relationship in R-L series circuit.
3. To study resonance of R-L-C circuits.
4. Open circuit and short circuit test of a single phase transformer.
5. Starting and reversing of speed of a D.C. shunt motor by changing connections.
6. Measurement of power in a three phase circuit by two wattmeter method.
7. No load characteristics of D.C. shunt Generators.
8. To measure power and power factor in a single – phase AC- circuit.
9. To verify Kirchhoff's Law.
10. To connect 3 identical single phase transformers for three phase power transformations through following connections (a) star-delta (b) star-star (c) delta-star (d) delta-delta and to find phase and line voltage ratio.
11. To start and reverse the direction of I-Q a.c. motor.
12. To verify superposition theorem.
13. To verify Norton's theorem.
14. To verify thevein's theorem.
15. To verify maximum power transformer theorem.

Course Name: Engineering Mathematics – III

Course Code: 100301

Semester: 3rd

L T P

Credits: 05 **4 1 0**

Course Contents

UNIT – I

1. **Fourier Series** Periodic functions, Euler's formula. Even and odd functions, half range Expansions.
2. **Laplace Transforms** Laplace transforms of various standard functions, properties of Laplace transforms, inverse Laplace transforms, transform of derivatives and integrals, Laplace transform of unit step function, impulse function, periodic functions, applications to

solution of ordinary linear differential equations with constant coefficients.

UNIT – II

1. **Partial Differential Equations** Formation of partial differential equations, Linear partial differential equations, homogeneous partial differential equations with constant coefficients Applications: Wave equation and Heat conduction equation in one dimension. Two dimensional Laplace equation, solution by the method of separation of variables.

UNIT – III

1. **Functions of Complex Variable** Limits, continuity, derivative of complex functions, analytic function, Cauchy-Riemann equation, conjugate functions, harmonic functions; Complex Integration: Line integrals in the complex plane, Cauchy's theorem, Cauchy's integral formula and derivatives of analytic function. Taylor's and Laurent's expansions (without proof),

UNIT - IV

3. **Residues and Contour integration** singular points, poles, residue, complex integration using the method of residues, evaluation of real integrals by contour integration.

Reference Books:

1. Thomes, G. B. & Finney, R.L. (1998). *Calculus and Analytic Geometry*. Addison Wesley.
2. Kreyszig, E. (1998). *Advanced Engineering Mathematics*. Eighth edition, John Wiley.
3. Grewal, B.S. (1965). *Higher Engineering Mathematics*. Khanna Publishers, New Delhi.
4. Babu, R. (2009).*Advance engineering Mathematics*. Pearson Education.

Course Name: Environmental Science

Course Code: 100302

Semester: 3rd

Credits- 04 **L T P**

3 1 0

1. Introduction: Definition and scope and importance of multidisciplinary nature of environment. Need for public awareness.

2. Natural Resources: Natural Resources and associated problems, use and over exploitation, case studies of forest resources and water resources.

3. Ecosystems: Concept of Ecosystem, Structure, interrelationship, producers, consumers and decomposers, ecological pyramids-biodiversity and importance. Hot spots of biodiversity

4. Environmental Pollution: Definition, Causes, effects and control measures of air pollution, Water pollution, Soil pollution, Marine pollution, Noise pollution, Thermal pollution, Nuclear hazards. Solid waste Management: Causes, effects and control measure of urban and industrial wastes. Role of an individual in prevention of pollution. Pollution case studies. Disaster Management :Floods, earthquake, cyclone and landslides.

5. Social Issues and the Environment From Unsustainable to Sustainable development, Urban problems related to energy, Water conservation, rain water harvesting, watershed management. Resettlement and rehabilitation of people; its problems and concerns. Case studies. Environmental ethics: Issues and possible solutions. Climate change, global warming, acid rain, ozone layer depletion,

nuclear accidents and holocaust. Case studies. Wasteland reclamation. Consumerism and waste products. Environment Protection Act. Air (Prevention and Control of Pollution) Act. Water (Prevention and control of pollution) Act. Wildlife Protection Act, Forest Conservation Act, Issues involved in enforcement of environmental legislation Public awareness

6. Human Population and the Environment, Population growth, variation among nations. Population explosion – Family Welfare Programme. Environment and human health, Human Rights, Value Education, HIV/AIDS. Women and child Welfare. Role of Information Technology in Environment and human health. Case studies

Suggested Readings / Books

Course Name: Electrical Measurements And Measuring Instruments

Course Code: 103301

Semester: 3rd

Credits- 04 **L T P**

3 1 0

Unit-1,

SI units, Classification of Standards, Time and Frequency Standards, Atomic frequency standard, Electrical standards - standards of e.m.f. and resistance, Frequency dependence of Resistance, Inductance and Capacitance.

Unit-2

Operating torque, damping and controlling torque, T/W ratio, Pointers and Scales. Principles of operation of various types of electro mechanical indicating / registering instruments, PMMC galvanometer,

Electrodynamometer, Moving iron meter, Rectifier and thermo-instruments, Ohmmeter, Comparison of various types of indicating instruments, Electrodynamometer type of wattmeter and power factor meter. Power measurement in poly phase systems - Two wattmeter method. Single phase induction type energy meter. Electronic multimeter, Digital Voltmeters, General characteristics

Unit-3

General equation for bridge balance, Wheatstone bridge and its sensitivity analysis, Kelvin double bridge, AC bridges: Applications and conditions for balance, Anderson bridge, Maxwell's bridge, Hay's bridge, Schering bridge, Wien bridge, De Sauty's bridge, Capacitance bridge.

Insulation testing, Sources of errors in bridge circuits, Shielding of bridge elements, Wagner Earthing Device.

Unit-4

Theory and construction of Current and Potential Transformers, Ratio and phase angle errors and their minimization, Characteristics of Current Transformers (CT) and Potential Transformers (PT).

Determination of B-H curve and Hysteresis loop, Measurement of iron losses with Llyod Fisher square.

Unit-5

Digital frequency Meter, Q meter, Distortion meter, Spectrum Analyzer, Oscilloscopes: Block diagram, CRT, Electrostatic deflection, CRT circuits, Applications of oscilloscopes.

Unit-6

Sensors : Resistive, Capacitive & Inductive, Digital Transducers

Books Recommended

1. A.K. Sawhney, (1998) *A Course in Electrical & Electronics Measurement and Instrumentation*, Dhanpat Rai & Sons.
2. Ernest.D (2001) *Measurement Systems: Application and Design*, Tata McGraw Hill.

Course Name: Magnetic Circuits And Transformers

Course Code: 103302

Semester: 3rd

Credits- 04 **L T P**

3 1 0

1. **Electromagnetism:**

   Review of electromagnetism, Magnetic field strength, Magnetic force.

2. **Magnetic Circuits**:

Magneto motive force, Reluctance, Laws of magnetic circuits, Determination of ampere-turns for series and parallel magnetic circuits, magnetic leakage and fringing, Hysteresis and Eddy current losses.

3. **Electromagnetic Induction:**

Faraday's laws, Lenz's law, Statically and Dynamically induced E.M.F., Energy stored in magnetic field.

4. **Transformers:**

Introduction, construction of single phase transformer, Principle of working, EMF equation, phasor diagram on no-load, leakage reactance, transformer on load, equivalent circuit, voltage regulation, power and energy efficiency, open circuit and short circuit tests, equivalent circuit parameters estimation.

Effect of saturation on exciting current, in-rush current phenomenon.

Parallel operation of single phase transformers.

5. **Auto Transformer:**

Principle of operation, comparison with two winding transformers.

6. **Three-Phase Transformers:**

Different winding connections, Voltage and current ratios, comparative features, effect of connections on exciting current, Parallel operation of three phase transformers, Scott connections.

Three winding transformer-equivalent circuit, off-load and on-load tap changing transformers

Books Recommended:

(i) Fitzgerald.K.K (1997) *Electric Machinery* . Mcgraw Hill
(ii) Say M.G. (2003) *Performance design & Testing of A.C. Machines*. CBS, Delhi
(iii) Kothari, N.(1998) *Electrical Machines.* TMH
(iv) Langsdorf, A.S. (2002) Theory of Alternating Current Machines. TMH

Course Name: Network Analysis & Synthesis

Course Code: 104302

Semester: 3rd

Credits- 04 **L T P**

3 1 0

1. **Basic of Circuit Analysis:**
   Network, Network types, independent & dependent sources, ideal voltage & current sources, signals, standard signals, other basic signals, waveform synthesis using different functions.

2. **Network Theorems**
   Introduction, Kirchoff's law, nodal & loop analysis, Thevenin's, Norton's, Superposition, Maximum power transfer & Reciprocity theorem.

3. **Time domain Analysis**
   Transient Response of RC, RL & RLC circuit with D.C. excitation, transient response of RC & RL circuit with A.C. excitation, time domain behavior from poles & zeros.

4. **Laplace Transform**
   Review of Laplace transform, initial & final value theorem, Time displacement theorem, convolution theorem, application of Laplace transform in electric circuit analysis.

5. **Network Functions**
   Introduction, impedance, admittance & transfer function, necessary conditions for transfer functions, properties of driving point admittance function, restriction on poles & zeros.

6. **Two port network**
   Introduction to one port & two port network, Z parameters, Hybrid parameters, networks synthesis using Foster & Cauer method.

7. **Network Filters**
   Filter, classification of filters, parameters of a filter, T & π section, terminating half section, ladder network.

8. **Filter Analysis & Design**
   Analysis of low pass, High pass, band pass & band stop filter, design of constant-k & m derived filter, introduction to composite filter.

Books Recommended:

(i) Chakraborty, A.K.(1998) *Circuit Theory*, Tata Mc-Graw Hill Publishing.
(ii) Sudhakar, S.M.(2004) *Network Analysis and Synthesis* , McGraw-Hill.
(iii) Soni K.M., (1997) *Circuits & Systems,* S K Kataria & Sons.

Course Name: PROGRAMMING IN C++

Course Code: 102304

Semester: 3rd

Credits- 04 **L T P**

3 1 0

Introduction

Basic concept of Object Oriented Programming, Benefits of OOP, Applications of OOP, Applications of C++, Structure of C++ program, C++ Statements, Identifiers and Constants, Keywords, Basic data types, User-Defined Data types, Variables, Operators in C++, Scope Resolution Operator, manipulators, Type cast operator, Control Statements, Array, Structure .

Functions

Function prototyping, Call by reference, Return by reference, Inline functions, Default arguments, Function Overloading, Friend and Virtual functions.

Classes and Objects

Specifying a Class, Creating class objects, Defining members of a class, nesting of member functions, private member functions, static member functions and friend functions.

Constructors and destructors

Constructor, Need for constructors, parameterized constructors, multiple constructors, constructors with default arguments, Copy constructor, Destructors.

Operator overloading

Overloading operators, unary and binary operator overloading.

Inheritance

Introduction, Defining derived classes, single inheritance; multiple inheritance; multi-level inheritance; hierarchical inheritance; hybrid inheritance; virtual base classes,

Polymorphism

Concept of binding - early binding and late binding, Pointers to objects, this pointer, pointers to derived classes, virtual functions, pure virtual functions.

Files

File stream, hierarchy of file stream classes, error handling during file operations, reading/writing of files, accessing records randomly, updating files.

TEXTBOOK

1. Balaguruswamy, E. (2000) *Object Oriented Programming with C++*, Tata Mc-Graw Hill.
2. Lafore, R. (1997) *Object-Oriented Programming in Turbo C++*, Published by Galgotia Publications.

Course Name: Electrical Measurements And Measuring Instruments Lab

Course Code: 103303

Semester: 3rd

Credits- 01 **L T P**

0 0 2

Note: Minimum of nine experiments from the following:

1. Calibration of AC Voltmeter and AC Ammeter
2. Measurement of form factor of a rectified sine wave and determine source of error if r.m.s.value is measured by a multi-meter
3. Measurement of phase difference and frequency of a sinusoidal AC voltage using C.R.O.
4. Measurement of power and power factor of a single phase inductive load and to study effect of capacitance connected across the load on the power factor
5. Measurement of low resistance by Kelvin's double bridge
6. Measurement of voltage, current and resistance using dc potentiometer
7. Measurement of inductance by Maxwell's bridge
8. Measurement of inductance by Hay's bridge
9. Measurement of inductance by Anderson's bridge
10. Measurement of capacitance by Owen's bridge
11. Measurement of capacitance by De Sauty bridge
12. Measurement of capacitance by Schering bridge

Course Name: PROGRAMMING IN C++ Lab

Course Code: 102304

Semester: 3rd

Credits- 01 **L T P**

0 0 2

SNo. **List of Experiments**

1. Write a program to print
   1
   12
   123
   1234
   123452.

2. Write a program to print
   1
   22
   333
   4444
   55555
3. Write a program generate the prime numbers.
4. Write a program addition of two square matrices.
5. Write a program multiplication of two matrices.
6. Write a program to substract two matrices.
7. Write a program to find whether the number is even, odd.
8. Write a program to find greatest out of three number using && operators.
9. Write a program to find whether the number is palindrome or not.
10. Write a program to print even number Series.
11. Write a program to print odd number Series.
12. Write a program to print prime number Series.
13. Write a program to find whether the number is prime or composite.
14. Write a program to find length of given Character string.
15. Write a program to find the reverse of number.
16. Write a program to add string2 into string1.
17. Write a program to compare two strings.
18. Write a program to copy sring2 into string1.
19. Write a program to find volume of (I) cylinder (II) cone.

Cont……..

20. Write a program to find factorial of number.
21. Write a program to add, multiply, subtract, divide two numbers using **nested if-else** in C++.
22. Write a program to implement switch case in C++.
23. Write a program to implement **for** loop, **while** loop and **do-while** loop in C++.

24. Write a program to enter record of 50 students.
25. Write a program to implement call by value.
26. Write a program to show **call by reference** in C++.
27. Write a program to create structure in C++.
28. Write a program to find the area of circle, rectangle and polygon by using structure.
29. Write a program to create classes in C++.
30. Write a program that uses a class where the member functions are defined inside a class.
31. Write a program that uses a class where the member functions are defined outside a class.
32. Write a program to demonstrate the use of static data members.
33. Write a program to demonstrate the use of **keyword const** data members.
34. Write a program using constructors in C++.
35. Write a program using destructors in C++.
36. Write a program using multiple constructors in C++.
37. Write a program using Copy constructor in C++.
38. Write a program to demonstrate the single inheritance.
39. Write a program to demonstrate the multilevel inheritance.
40. Write a program to demonstrate the multiple inheritances.
41. Write a program showing hierarchal inheritance in C++.
42. Write a program to implement function overloading.
43. Write a program to demonstrate the overloading of binary arithmetic operators.
44. Write a program showing operator overloading in C++.
45. Write a program to demonstrate the use of function template.
46. Write a program to demonstrate the use of class template.
47. Write a program showing Exception handling in C++.
48. Write a program to read and write data from a file in C++.
49. Write a program to demonstrate the reading and writing of mixed type of data.

50. Write a program to demonstrate the reading and writing of objects.

Course Name: Electronic Devices & circuits

Course Code: 104402

Semester: 4th

Credits- 04 **L T P**

3 1 0

1. **Bipolar Junction Transistors:**
   Introduction, transistor construction, operation, NPN &PNP, characteristics of transistor in CE,CB & CC configuration , transistor as an amplifier, transistor at low frequency, h-parameters, h-parameters equivalent circuits, conversion formulas, analysis of CE, CB & CC configuration using h parameters, UJT(construction and characteristics only)

2. **Field Effect Transistors:**
   JFET construction, V/I characteristics, transfer characteristics, comparison of BJT and FET, MOSFET, both (depletion and enhancement type),FET as an amplifier.

3. **Transistor Biasing and Stabilization:**
   Operating point, bias stability, various biasing circuits, stabilization against I_{co}, V_{be} and beta. bias compensation methods and thermal runaway.

4. **Switching Characteristics of Devices:**
   Steady state and transient behaviors of electronic Switches (Diode & transistor), dynamic analysis of switches, charge storage phenomena, switching characteristics, delay time, rise time, storage time and fall time, use of Schotkey diode for reducing storage time. behavior of MOS transistor as switch.

5. **Regulated Power Supply**:
   Zener diode as voltage regulator, discrete transistor series and shunt voltage regulator, current limiting, line and load regulation, SMPS

6. **Multi-vibrators**:
   Introduction of multi-vibrator, astable, monostable and bistable multi-vibrators, Schmitt trigger using transistor

Books Recommended:

1. Millman, J and Halkiias, (1998) *Integrated Electronics*, TMH.
2. Ryder,J.D.(2003) *Electronic Fundamentals & Application*, PHI.
3. Boylestad R.L. (1997) *Electronic Devices and Circuit Theory, VIII Edition,* Pearson Education.
4. Sedra & Smith. (2000) *Microelectronic Circuits, , V Edition,* Oxford University Press.
5. Millman and Taub. (2004) *Pulse digital and switching waveforms,* Mcgraw Hill, USA

Course Name: EMEC & DC MACHINES

Course Code: 103401

Semester: 4th

Credits- 04 **L T P**

3 1 0

1. **Electromechanical Energy Conversion**
   Energy stored in electric and magnetic fields, energy conversion in singly and multiple excited systems, reluctance torque, reluctance and hysteresis motors.

2. **D.C. Machines:**

   Armature windings, single and double layer windings & winding diagrams, E.M.F. and torque equations, interaction of fields produced by excitation circuit and armature, effect of brush shift, compensating winding.

   Commutation, causes of bad commutation, methods of improving commutation,

   D.C Generators: Construction, Principle of operation, Methods of excitation of d.c. generators and their no load and load Characteristics.

   D.C. motors: Construction, Principle of operation, Characteristics, Starting of Shunt and Series motor, Starters, Speed control methods- Field and Armature control, Ward Leonard method .

   Braking: plugging, dynamic and regenerative braking, Testing: Swinburn's test, Hopkinson test, Field test. Estimation of losses and efficiency.

3. **Cross-Field Machines:**

   Principle of working, Analysis of cross-field generator, typical characteristics with different compensations. Applications.

Books Recommended:

1. Nagrath & Kothari.(2000) *Electrical Machines*, McGraw-Hill

2. Bhimbhra,P.S. (1998) *Electrical Machinery*, Khanna Publishers

Course Name: Digital Electronics

Course Code: 104401

Semester: 4th

Credits- 04 **L T P**

3 1 0

1. Number System And Binary Code:

Introduction of analog and digital signals , Binary, Octal and hexadecimal number system, signed and unsigned number, arithmetic operations-addition, Subtraction, Multiplication and division of binary, octal and hexadecimal number system, conversions of number systems, 1's complement, 2's complement, 9's complement and 10's complement, BCD code, ASCII code, Excess 3 code, Gray code.

2. Minimization of logic function:

OR, AND,NOT,NOR,NAND,EX-OR operations and gates, Boolean theorems, De-morgans theorem, sum of products and product of sums, canonical form, Minimization using theorems , K-map and Q-M method.

3. Combinational Logic Circuits:

Introduction, Combinational circuit design, multiplexers, Demultiplexer, encoders, decoders, adders, subtracters, code converters, parity checker, parity generator, BCD display drive, magnitude comparators.

4. Sequential Circuits:

Introduction, latches, flip-flops and their conversions, Shift registers, sequential PLDs, synchronous design methodology, Synchronizer failure and metastability, counters, counter design with state equation and state diagrams.

5. D/A and A/D Converters:

Introduction, Weighted resister D/A converter, binary ladder D/A converter, parallel A/D converter, Counter type A/D converter ,Successive approximation A/D converter, single and dual slope A/D converter, specifications of ADC & DAC.

6. Semiconductor Memories:

Introduction, Memory organization and expansion, Classification and characteristics of memories, sequential memories, ROM, RAM, Content addressable memories, Charged-Coupled device memory.

7. Logic Families:

Various types of logic families, Comparison of logic families, Characteristics of digital circuits, Tristate Logic.

Books Recommended:

1. Malvino, (1998) *Digital principle and applications*, (TMH)
2. Jain, R. P.(2002) *Modern digital electronics*, (PHI)
3. Mano, M.M. (2001) *Digital Design* , (PHI)

Course Name: Power Plant Engineering

Course Code: 103402

Semester: 4th

Credits- 04 **L T P**

3 1 0

Steam Generators, Condensers and Turbines:

Classification of steam generators, selection, operation of locomotive, Babcock Wilcox, Cochran boilers, Types of condensers, effect of air in condensers, Dalton's law of partial pressure, cooling water calculations, steam nozzles, types of steam turbine efficiencies, compounding, governing and control.

Steam Power Plant:

Classification, Operation, Description of Rankine cycle, Regenerative cycle, Reheat-Regenerative Cycle, Binary Vapour Cycle, Selection of plant site and its layout, coal handling system, combustion system, Fluidized bed combustion, Ash handling, Feed pumps, Heat exchangers, Economizers, Super heaters, Reheaters, Air preheaters, Feed water heaters, Evaporators.

Hydro-Electric Power Plants:

Hydrological Cycle, Hydrograph, Flow duration curve, Selection of site, Essential features, Classification of hydro plants, Selection of water turbines for hydro power plant, Automatic and remote control of hydro station, layout of hydro power plant.

Nuclear power plants:

Nuclear physics, Binding energy, Radio active decay. Fertile material, Mass defect, Nuclear reactions type and application, Generation of nuclear energy by fission, Nuclear reactors. Site selections, safety measures, plant layout, Fusion reaction, Future of nuclear power.

Gas Turbine:

Elements of gas turbines, Open and closed cycles for gas turbines, Performance terms, Thermal refinement to gas turbines cycle, Plant layout, applications, gas turbines Cycle calculations.

Diesel Power Plants:

Classifications of IC Engines and their performance, Four stroke and two stroke diesel engines, combustion phenomenon; Essential components, Celane number, knocking, super charging, operation and layout of diesel power plant.

Combined Operation of Different Power Plants:

Advantages of combined operation of plants, load division between power stations, coordination of different types of Power Plants.

Pollution Control:

Pollution from thermal & nuclear plants, Particulate emission and control, electrostatic precipitator, solid waste disposal.

Reference Books:

1. Sharma, P.C. (1999) *Power Plant Engineering* (Kataria & Sons)

2. Skrotzki, B.G.A. & Vapot, W. (2001) *A Power Station Engineering and Economy* (TMH)

3. Rajput, R.K. (1997) *Power Plant Engineering* (Luxmi Publications)

Course Name: Power System -I (Transmission & Distribution)
Course Code: 103403

Semester: 4th

Credits- 04 **L T P**

3 1 0

1. Electric power Supply Systems

Introduction to Transmission& Distribution systems, comparison between AC & DC systems , comparison of cost of conductors, Effect of increase of transmission lines voltages, Economic size of conductor- Kelvin law, Radial & Mesh distribution networks, comparison of Overhead and underground system, Growth of power system in India, Comparison of volume of conductor required for various systems for transmission.

2. Mechanical design of overhead lines

Conductor Materials; ACSR, hollow and bundle conductor. Different types of line supports, Stringing of conductor, calculation of sag, clearance from ground, overhead line insulators, concept of string efficiency. Insulation failure, string chart.

3. **Transmission Line Parameters**

Introduction to Line Parameters, Resistance of Transmission Line, Inductance and Capacitance of single phase two wire line, Concept of G.M.D, Transposition of Power Lines, Effect of Earth on Capacitance of Conductors, skin and proximity effect.

1. **Performance of Transmission Lines**

Representation of Lines, short Transmission Line, Analysis of medium length line, long length line, ABCD constants, Ferranti effect, Crona, Critical Disruptive Voltage, Corona loss, Factors affecting Corona ,Disadvantages of Corona.

2. **Circle Diagram& Line Compensation**

Receiving End and Sending End circle diagrams based on ABCD constants. Surge Impedance Loading, Reactive power requirement of system Series and shunt compensation, Synchronous Phase Modifiers.

3. **Underground Cables**

Types of Cables based upon voltage and current rating, Insulation resistance of cable ,dielectric stress, capacitance of cable, Laying of cables.

Recommended Books

1. Elgerd O.L.(2001) *Electrical Energy System Theory - An introduction,* (TMH)

2. Stevenson Jr W.D.(1999) *Elements of Power System Analysis,* TMH

3. Wadhwa C.L. (2000) *Course in Electrical Power*, New Age Int.(P)Ltd.

4. Nagrath and Kothari,(2003) *Power System Analysis*, (TMH)

5. Gupta, B.R. (2001) *Power System Analysis & Design,* Wheeler Publishing.

Course Name: Linear Control Systems
Course Code: 104404

Semester: 4th

Credits- 04 **L T P**

3 1 0

Course Objective:

This course is aimed to provide a comprehensive treatment of the analysis and design of control systems so as to empower the students with knowledge which is sufficient to help them understand and analyze the practical problems in industry.

1. **Introduction:**
   Concept of Plant, Servomechanism, Open loop control system, closed loop systems, Use of Laplace transform, Transfer function

2. **Modeling:**
   Formulation of equations of Linear electrical, mechanical systems, analogy between electrical & mechanical systems, Block diagram algebra, signal flow graphs, Mason's formula & its application.

3. **Time Domain Analysis:**
   Typical test - input signals, transient response of the first and second order systems. Time domain specifications, steady state errors and error constants.

4. **Stability**:
   Concept of stability, absolute stability, Relative stability, Pole-zero location and stability order systems, steady state error and error coefficients, Routh-Hurwitz stability criteria

5. **Root Locus Technique:**
   The root locus concept, Construction of Root loci for various systems, stability considerations.

6. **Frequency Domain Analysis:**
   Frequency response specifications, relation between time and frequency response, Bode plots, Polar Plot, Nyquist criterion.

7. **Compensation:**
   Necessity of compensation, Phase lag compensation, Phase lead compensation, Phase lag-lead compensation, feed back compensation.

8. **Control Components:**
   Potentiometer as an Error detector, servo motors , A.C. and D.C, techogenerators

Books Recommended:

1. Ogata, K. (1999) *Modern Control Engg.* Prentice Hall, New Delhi.
2. Gibsen, J.F. (2007) *Control System Components*, Mcgraw Hill.
3. Kuo, B.C.(1998) *Automatic Control System*, Prentice Hall.
4. Nagrath,I.J. (2004) *Control System Engineering*, Wiley Eastern Ltd., New Delhi.

Course Name: Electronic Devices & circuits Lab
Course Code: 104402

Semester: 4th

Credits- 01 **L T P**

0 0 2

1. Study of Half wave, full wave & Bridge rectifiers.
2. Study of simple capacitive, T & π filters
3. Study of Zener regulator.
4. To plot the input and output characteristics of CE configuration.
5. To plot the input and output characteristics of CB configuration.
6. Determination of h- parameters of a transistors using output characteristics.
7. Design of transistor biasing circuits.
8. Study of frequency response of RC coupled amplifier.
9. Study of an emitter follower circuit.
10. To plot JFET characteristics in CS configuration.
11. Study of frequency response of CS- FET amplifier.
12. Study of multi-vibrators
    a) Monostable multi-vibrator of t=0.1 msec. approx.) using 74121/123. Testing for both positive and negative edge triggering, variation in pulse with and retriggering.
    b) Free running multi-vibrator at 1 KHz and1 Hz using 555 with 50% duty cycle. Verify the timing from theoretical calculations.

Course Name: Electrical Machine - I Lab
Course Code: 103404

Semester: 4th

Credits- 01 **L T P**

0 0 2

List of Experiments:

1. To perform Open circuit and short circuit tests on a single phase transformer and hence find equivalent circuit, voltage regulation and efficiency.
2. To find the efficiency and voltage regulation of single phase transformer under different loading conditions.
3. To perform parallel operation of two single phase transformers.
4. To study the various connections of three phase transformer.
5. To study the constructional details of D.C. machine and to draw sketches of different components/ parts.
6. To measure armature and field resistance of DC shunt generator and to obtain its open circuit characteristics.
7. To obtain load characteristics of DC. shunt/series /compound generator.
8. To draw speed-torque characteristics of DC. shunt/series /compound motor.
9. To study DC. motor starters.
10. To perform Swinburne's test (no load test) to determine losses of DC machines.

Course Name: Digital Electronics Laboratory

Course Code: 104407

Semester: 4th

Credits- 01 **L T P**

0 0 2

1. a) Verification of the truth tables of TTL gates, e.g., 7400, 7402, 7404, 7408, 7432, 7486.
   b) Design, fabrication and testing of low frequency TTL clocks using NAND gates.

2. a) Verification of the truth table of the Multiplexer 74150.
   b) Verification of the truth table of the De-Multiplexer 74154.

3. Design and verification of the truth tables of half adder and full adder circuits using gates 7483.
4. Study and verification of the operations of ALU 74181 with regards to addition / subtraction / comparison.
5. Design fabrication and testing of differentiator and integrator circuits using OP AMP.
6. Design fabrication and testing of clipper and clamper circuits using OP AMP.
7. Design fabrication and testing of
   a) Mono-stable multi-vibrator of t = 0.1 msec. approx.) using 74121/123. Testing for both positive and negative edge triggering, variation in pulse with and retriggering.

   b) Free running multi-vibrator at 1 KHz and1 Hz using 555 with 50% duty cycle. Verify the timing from theoretical calculations.

8. Design fabricate and test a switch depouncer using 7400.
9. a) Design and test of an S-R flip-flop using NOR/NAND gates.
   b) Verify the truth table of a J-K flip-flop (7476)

   c) Verify the truth table of a D flip-flop (7474) and study its operation in the toggle and asynchronous modes.

10. Operate the counters 7490, 7493 and 74192. Verify the frequency division at each stage. With a low frequency clock (say 1 Hz) display the count on LEDs.
11. a) Verify the truth table of decoder driver 7447 / 7448. Hence operate a 7 segment LED display through a counter using a low frequency clock.
    b) Repeat the above with the BCD to Decimal decoder 7442 and an array of LEDs.

CO5	2	2	2	2	1	2	2	2	2	2	2	2	2

Course Name: Control System Lab including MATLAB /SIMULINK simulations

Course Code: 104406

Semester: 4th

Credits- 01 **L T P**

0 0 2

Control System Lab including MATLAB /SIMULINK simulations (104406)

Credit: 01 **L T P**

0 0 2

1. To study the input-output characteristics of a potentiometer and to use a potentiometer as an error detector.

2. To study transmitter - receiver characteristics of a synchros set and to use the set as control component.

3. To study the operation of DC position control servo system.

4. To study the operation of an AC. position servo system.

5. To design different compensating networks for the given cut off frequency response.

6. Study of a stepper motor and control of its direction, speed and no. of steps with the help of a microprocessor.

To perform exercises related to the following by writing computer programs and functions in MATLAB using Control System Toolbox:

Time and Frequency response of control systems

Plotting of Bode, Nyquist and Root Loci diagrams.

Design of Control Systems using MATLAB and SIMULINK.

Course Name: Asynchronous Machines

Course Code: 103501

Semester: 5th

Credits- 04 **L T P**

3 1 0

Objective:- To learn the constructional details, Principle of operation, equivalent circuits and performance evaluation of induction machines and stepper motors which are widely used in industries.

1. BASIC CONCEPTS:

Field distribution of space distributed three-phase winding, concept of rotating field, production and concept of asynchronous and synchronous torques.

2. POLYPHASE INDUCTION MACHINES:

Constructional features, operation, equivalent circuit, phasor diagram , leakage reactance and it's importance on machine performance, effect of rotor circuit resistance, starting torque, cage motors, double cage and deep bar motor. Generator action, methods of excitation, space harmonics and their effect on motor performance, starting methods, speed control: (i) control of speed of rotating field, (ii) control of slip speed. Estimation of equivalent circuit parameters

Effect of voltage injection in rotor circuit of slip ring induction motor, action of commutator, scherbius and kramer schemes of speed and P.F. control of induction motors.

3. STEPPER MOTORS AND LINEAR INDUCTION MACHINES

Stepper Motors: construction, principle of operation and applications. Linear Induction Machines: construction, principle of operation and applications.

4. SINGLE –PHASE MOTORS:

Single phase induction motor, double revolving field theory, equivalent circuit, characteristics. phase splitting, shaded pole motor, single phase series and repulsion motor: working and characteristics.

RECOMMENDED BOOKS:

1. Fitzgerald A. E. and Kingsley C.(2013) *Electric Machinery* Mcgraw Hill Education

2. Alexander S. Langsdorf, (1955) *Theory Of A.C. Machines*, Mcgraw Hill Education

Course Name: Electromagnetic Field Theory

Course Code: 104403

Semester: 5th

Credits- 04 **L T P**

3 1 0

Course Objective:

The objective of this course is to make the students able to calculate electric field, force, potential , energy from various charges and charge distribution, electric flux, flux density, electric current density . The students would be able to apply Maxwell's equations for electromagnetic wave propagation etc.

1. **Introduction**
   Definition of curl, divergence and gradient, Stokes Theorem and Divergence Theorem, definition of electric field intensity, electric field due to discrete charges, electric field due to continuous charge

distribution, electric field due to charges distributed uniformly on an infinite and finite line, electric field due to an infinite uniformly charged sheet, electric flux density, Gauss's law, proof of Gauss's law, relationship between potential and electric field, magnetic field intensity due to a finite and infinite wire carrying a current I, magnetic flux density, the Lorentz force equation for a moving charge and its applications, magnetic moment, magnetic vector potential.

2. **Electromagnetic Waves**
   Maxwell's equations in differential and integral forms, concept of displacement current, boundary conditions, wave equation and its solution in different media, plane wave, polarization, reflection of wave by perfect dielectric and by perfect insulators, surface impedance, Poynting Theorem and Poynting Vector.

3. **Transmission Lines**
   Transmission line as a distributed circuit, transmission line equation, travelling and standing waves, characteristic impedance, input impedance of terminated line, reflection coefficient, VSWR, Smith's chart and its applications.

4. **Guided Wave**
   Waves between parallel planes, TE and TM waves and their characteristics, TEM waves, velocity of propagation, attenuation in parallel plane guides, wave impedance.

5. **Wave Guides**
   Rectangular and circular waveguides, TE and TM waves in rectangular waveguides, impossibility of TEM wave in waveguides, wave impedance and characteristic impedance, transmission line analogy for waveguides, attenuation factor of waveguides, dielectric slab waveguides.

Books Recommended:

1. Edward C. Jordan and Keith G. Balmain, (2003) *Electromagnetic Waves and Radiation System*, Prentice Hall of India. Pvt. Ltd.
2. Kraus/ Fleisch,(1999) *Electromagnetics*, Tata McGraw Hill.
3. Fraser,W. (2003) *Telecommunications*, CBS Publication and Distributor.

Course Name: Industrial Electronics

Course Code: 103502

Semester: 5th

Credits- 04 **L T P**

3 1 0

Objective: To make the students familiar with basic concepts of thyristors, rectifiers, choppers etc and their applications.

1. THYRISTORS:

Terminal characteristics of thyristors, Thyristor turn-on methods, switching characteristics of thyristors,Thyristor gate characteristics, two transistor model of a thyristor, thyristor ratings, thyristor protection, other members of the thyristor family-PUT,SUS,SCS,Light activated thyristors, Static induction thyristor, DIAC & TRIAC. Thyristor specification. Protection of SCR from overvoltage & overcurrent , power dissipation & heat sink etc.

2. **THYRISTOR COMMUTATION TECHNIQUES:**

Load commutation, resonant-pulse commutation, complementary commutation, impulse commutation, External pulse commutation, line commutation.

3**. PHASE CONTROLLED RECTIFIERS:**

Principle of phase control-Single-phase half-wave circuit with RL, RLC, RL and FD load, Full-wave controlled converters, Single-phase full-wave converters: Single-phase full wave midpoint converter, single phase full-wave bridge converters-Single-phase full converters, single phase semi converter, Dual converter.

4. CHOPPERS:

Principle of chopper operation, control strategies, step-up choppers, types of chopper circuit-Type-A,B,C,D,E choppers.

5. **CYCLOCONVERTERS:**

Principle, Step up cycloconverters, midpoint cycloconverter, bridge-type cycloconverter, three-phase half wave cycloconverters-three phase to single phase cycloconverters, three phase to three phase cycloconverters.

6. **APPLICATIONS:**

Switched mode power supply, uninterruptible power supply, and high voltage DC transmission. Inverter

BOOKS RECOMMENDED

(i) Reddi S R,(2002) *Fundamentals of Power Electronics*, Narosa Publishing House Pvt. Ltd, New Delhi
(ii) Mohammad H.(2005) *Power Electronics, Circuits Devices and Applications* Khanna Publishers, New Delhi
(iii) Bhattacharya S.K.(1998), *Industrial Electronics & Control* New Age international Publications(P) Ltd, New Delhi.

Course Name: Microprocessors & its applications

Course Code: 104505

Semester: 5th

Credits- 04 **L T P**

3 1 0

Section – A

Introduction to Microprocessor

History and Evolution, types of microprocessors, 8085 Microprocessor, Architecture, Bus Organization, Registers, ALU, Control section, Instruction set of 8085, Instruction format, Addressing modes, Types of Instructions.

Assembly Language Programming and Timing Diagram

Assembly language programming in 8085, Macros, Labels and Directives, Microprocessor timings, Micro instructions, Instruction cycle, Machine cycles, T states, State transition diagrams, Timing diagram for different machine cycles.

Section – B

Serial I/O, Interrupts and Comparison of Contemporary Microprocessors

Serial I/O using SID, SOD, Interrupts in 8085, RST instructions, Issues in implementing interrupts, Multiple interrupts and priorities, Daisy chaining, Interrupt handling in 8085, Enabling, disabling and masking of interrupts, Brief comparison of contemporary 8-bit microprocessors like Z-80, M68000 with 8085.

Data Transfer Techniques

Data transfer techniques, Programmed data transfer, Parallel data transfer using 8155. Programmable parallel ports and handshake input/output, Asynchronous and Synchronous data transfer using 8251A. Programmable interrupt controller 8259A. DMA transfer, cycle stealing and burst mode of DMA, 8255, 8257 DMA controller.

Section – C

Microprocessor Interfacing Techniques

Interfacing memory and I/O devices, Addressing memory, interfacing static RAMs, Interfacing and refreshing dynamic RAMs, Interfacing a keyboard, Interfacing LED and seven segment displays, Interfacing a printer, Interfacing A/D converters, D/A converters.

Architecture of Typical 16 Bit Microprocessors (Intel 8086)

Memory address space and data organization - Segment registers and memory segmentation - Generating a memory address - I/O address space - Addressing modes.

Books Recommended:

(i) Ramesh. S. Gaonkar,(2000) *Microprocessor Architecture, Programming and applications with the 8085*, Penran International Publishing
(ii) Muhopadhyay A.H.(1998) *Microprocessor Based Laboratory Experiments and Projects*, Wheeler Publishing.

Course Name: Analog Electronics

Course Code: 104502

Semester: 5th

Credits- 04 **L T P**

3 1 0

Course Objective:

Objective of this course is to give knowledge about most useful semiconductor device (transistor) applications, analysis and design of analog electronic circuit

1. **Transistor at High Frequencies:**
   Transistor model at high frequencies (hybrid pi CE transistor model), CE short circuit current gain obtained with hybrid pi model, emitter follower configuration, miller s theorem, coupling of transistor amplifiers, cascading of RC coupled amplifier and their analysis

2. **Large Signal Amplifiers:**
   Classification of amplifiers, Types of Multistage amplifiers, Class A direct coupled with resistive load, Transformer coupled with resistive load, and their efficiency, harmonic distortion, thermal runaway, Harmonics, heat sinks, output transformer saturation, push-pull amplifiers (class A and B), crossover distortion, class AB push-pull amplifier, complementary- symmetry amplifier. Wideband amplifiers

3. **Tuned Amplifiers:**
   Single tuned, double tuned and stagger tuned amplifiers and their analysis.

4. **Feedback in Amplifiers:**
   Feedback concept, Types of feedback, effect of negative feedback on gain, bandwidth, stability, distortion and frequency response etc. Voltage series, current series, voltage shunt, current shunt feedback circuits and their analysis.

5. **Oscillators:**

Conditions for sustained oscillations, different types of oscillators, description of circuit and working of RC Phase Shift, Wein Bridge, Hartley, Colpitts and Crystal Oscillators.

6. **Operational Amplifier & Wave Shaping Circuits:**
High pass and low pass circuits using R-C, R-L, R-L-C circuits, Differentiator, integrator, response to standard waveforms, Attenuators, Clipping and Clamping circuits, comparators. Operational Amplifier.

Books Recommended:

1. Jacob,M.(2000), *Electronic Devices and Circuits,* Tata McGraw Hill.
2. Robert, L. (1997) *Electronic Devices and CircuitsTheory,* Prentice Hall India Pvt. Ltd.

Course Name: Electric Drives

Course Code: 103504

Semester: 5th

Credits- 04 **L T P**

3 1 0

Objective:- To understand the dynamics of electrical drives and static control of electric motors.

Definitions, Dynamics of Electric Drives: Concept of electric drive and its classifications, Types of loads, Four-quadrant drive, dependence of load torque on various factors, Dynamics of motor-load combination, Steady state stability of an electric drive system. Load Equalization

Drive Features of Importance: Multi-quadrant operations of DC and AC motors. Energy relations during starting and braking.

Static Control of Motors: Contactors and relays for electric drives. Control circuits for automatic starters of DC and AC motors including definite time accelerating type.

Estimation of Motors Rating: Types of duty cycles, Calculation of motor rating for duty cycles, Use of load diagrams.

Semiconductor Controlled Drives: Control of DC drives fed through single-phase and three-phase semi converter and full-converter phase-controlled configurations. Their analysis, Regeneration and braking through static power converters, Control of three phase induction motors by stator voltage and frequency

control for speeds below and above synchronous speed. Static Rotor resistance control, Static Kramer and Scherbius drives.

Recommended Books

1. Pillai, S.K. (2000) *A First Course On Electrical Drives,* New Age Publications.

Course Name: JAVA LAB

Course Code: 102610

Semester: 5th

Credits- 01 **L T P**

0 0 4

1. Write a Java program which does the creation of Class and object.

2. Usage of import statement and package declaration in java programs.

3. Declaring variables of various data types and their effect by changing the access

modifiers like private, public, protected, default.

4. Usage of Java keywords final, static, transient, volatile, synchronized at appropriate places in java programs.

5. Writing programs which make use of Arithmetic Operators, Comparison Operators,

Logical Operators, Bit wise Operators.

6. Writing programs which make use of && and II operators.

7. Write Java programs, which make use of control Statement like if, while, do while.

Try, catch, finally, throw, throws.

8. Write code snippets which make usage of Method Overloading, method Overriding,recursion,

9. Using super, this, super (), this () in Java Programs.

10. Write Java Programs, which make usage of Exception handling

11. Write java programs that make usage of java lang.awt package and design GUI.

12. Usage of event handling in Java GUI (Graphical user interface) programs.

Course Name: Analog Electronics Laboratory

Course Code: 103505

Semester: 5th

Credits- 01 **L T P**

0 0 2

1. To study the various coupling techniques for transistor amplifiers.
2. To study the characteristics of a Class- A amplifier.
3. To study the characteristics of Class- B amplifier.
4. To study the characteristics of Class-C amplifier.
5. To study the characteristics of Class- AB amplifier.
6. To study the characteristics of Class- B push-pull amplifier.
7. To study the characteristics of complementary symmetry amplifier.
8. To study transistor series voltage regulator with current limit and observe current fold-back characteristics.
9. To study the response of RC phase shift oscillator and determine frequency of oscillation.
10. To study the response of Hartley oscillator and determine frequency of oscillation.
11. To study the response of Colpitt's oscillator and determine frequency of oscillation.
12. To study the response of Wien Bridge oscillator and determine frequency of oscillation.

Course Name: Industrial Electronics & Drives Lab
Course Code: 103506

Semester: 5th

Credits- 01 **L T P**

0 0 2

List of Experiments :

1. To study principle of operation of SCR, plot V-I characteristics and study the effect of gate

triggering on turning on of SCR.

2. To draw V-I characteristics of a UJT and to use UJT as relaxation oscillator.

3. To study the effect of free-wheeling diode on power factor for single phase half-wave rectifier with R-L load.

4. To plot waveforms for output voltage and current, for single phase full-wave, fully controlled bridge rectifier, for resistive and resistive cum inductive loads.

5. Study of the microprocessor based firing control of a bridge converter.

6. To study three phase fully controlled bridge converter and plot waveforms of output voltage, for different firing angles.

7. Study of Jones chopper or any chopper circuit to check the performance.

8. Thyristorised speed control of a D.C. Motor.

9. Speed Control of induction motor using thyristors.

10. Study of series inverter circuit and to check its performance.

11. Study of a single-phase cycloconverter.

12. To check the performance of a Mc Murray half-bridge inverter.

Course Name: Microprocessors Lab
Course Code: 104509

Semester: 5th

Credits- 01 **L T P**

0 0 2

List of Experiments:

1. Study of 8085 Microprocessor Kit.
2. Write a program to add two 8-bit number using 8085 and 8086.
3. Write a program to add two 16-bit number using 8085 and 8086.
4. Write a program to subtract two 8-bit number using 8085 and 8086.
5. Write a program to subtract two 16-bit number using 8085 and 8086.
6. Write a program to multiply two 8 bit numbers by repetitive addition method using 8085 and 8086.

7. Write a program to multiply two 8 bit numbers by rotation method using 8085 and 8086
8. Write a program to multiply 16-bit number with 8-bit number using 8085 and 8086.
9. Write a program to generate fibonacci series using 8085 and 8086.
10. Write a program to sort series using bubble sort algorithm using 8085 and 8086.
11. Study 8086 Microprocessor kit
12. Write a program to copy 12 bytes of data from source to destination using 8086.
13. Write a program to find maximum and minimum from series using 8086.
14. Write a program to control the operation of stepper motor using 8085 and 8086 microprocessors and 8255 PPI.
15. Write a program for finding square of a number using look-up table and verify.
16. Write a program to control the temperature using 8085 and 8086 microprocessors and 8255 PPI.
17. Write a program to control the traffic light system using 8085 and 8086 microprocessors and 8255 PPI.
18. Write a program to control speed of DC motor using 8085 and 8086 microprocessors

Course Name: Synchronous Machines
Course Code: 103601

Semester: 6th

Credits- 04 **L T P**

3 1 0

1. GENERAL ASPECTS

Construction & working principle of synchronous machines, Excitation systems, production of sinusoidal E.M.F., flux & mmf phasors in syn. machines; cylindrical & salient pole rotors.

2. WINDINGS

Classification of windings, pitch factor, distribution factor.E.M.F. equation.

3. ALTERNATORS

Construction, Phasor diagram of cylindrical rotor alternator, ratings, nature of armature reaction, determination of synchronous reactance; open circuit characteristics, short ckt characteristics, short ckt ratio, short ckt. loss. Effect of variation of power factor on voltage. Determination of voltage regulation: EMF method, M.M.F. method. Z.P.F. method.

Alternator on infinite bus bar, operating characteristics, operation at constant load and variable

excitation, power flow through inductive impedance. Power-angle characteristics of syn. machines:- cylindrical & salient pole. Two reaction theory of salient pole machines, power factor control.

4. SYNCHRONOUS MOTORS

Operating characteristics, power-angle characteristics, conditions for maximum power developed .V-curves and inverted V-curves, methods of starting, synchronous motors applications, synchronous condensers.

5. PARALLEL OPERATION OF ALTERNATORS

Conditions for proper synchronizing for single phase and three phase alternators, conditions for parallel operation, synchronizing power, current and torque, effect of increasing excitation of one of the alternators, effect of change of speed of one of the alternators, effect of unequal voltages, load sharing. Hunting and damper windings.

6. TRANSIENTS

Transients Analysis, transient reactance & time constants from equivalent circuits, synchronous machine reactance & their determination, Short circuit. Oscillogram,

Synchronization with the grid system, Qualitative introduction to the transient stability of the synchronous machines.

7. SINGLE PHASE SYNCHRONOUS MOTORS

Reluctance & Hysteresis motors.

Books Recommended

1. Fitzgerald & Kingsley (1990) *Electric machines* Mc Graw Hill

2. M.Kosow. (2000) *Electric machinery and transformer* PHI

3. Nagrath & Kothari (2003) *Electrical machines* TMH

5. Say, M.G.(1997) *Performance,design and testing of A.C. machines* C.B.S,Delhi

Course Name: Power System -II (Switchgear & Protection)
Course Code: 103602

Semester: 6th

Credits- 04 **L T P**

3 1 0

Objective:- To learn about the basic principles and devices for protection of electrical equipments against faults.

1. FAULT ANALYSIS:

Types of fault, Balance & unbalanced fault.

2. **Isolators& fuses**:

Types of fuse, rating & operation, characteristics and selection of fuse material, isolating switches functions. Function of switchgear.

3. Circuit Breakers:

Need of Circuit Breakers, types of Circuit Breakers, working principle of Circuit Breakers, comparison between Circuit Breakers, Arc phenomenon.

4. Protective Relays:

Classification, Constructional& characteristics of electromagnetic induction, thermal, over current relays, directional& distance relays. Earth fault relay. –ve sequence relay.

5. Protection of feeders:

Reactance& mho relay, time graded protection, differential& distance protection of feeder, current carrier protection.

6. Protection of Generators and transformers

Types of faults on alternator, stator& rotor protection, loss of excitation& overload protection. Types of fault on transformer, gas relays.

7. Protection against over voltage and earthing.

Ground wires, rod gap, impulse gap, selection of grounding, line absorber/ surge absorber.

RECOMMENDED BOOKS

1. Rao, S. (2001). *Testing, Commissioning, Operation and Maintenance of Electrical Equipment by Khanna Technical Publication*. New Delhi

2. Wadhwa, C.L. (1996) *Electrical Power Systems*. Wiley Eastern Ltd. New Delhi

3. Uppal, S.L. (2003). *Electrical Power*. Dr. Khanna Publications. Delhi.

Course Name: Generation of Electrical Power
Course Code: 103603

Semester: 6th

Credits- 04 **L T P**

3 1 0

Objective:- To learn the basic concepts of load curves, tariffs, economics operations of power systems and pollution control.

1. Introduction:

Electrical energy sources, organization of power sector in India, single line diagram of thermal, hydro and nuclear power stations.

2. Loads and Load curves:

Maximum demand, Group diversity factor, Peak diversity factor, Types of load, chronological load curves, load-duration Curve, mass curves, load factor, capacity factor, utilization factor, base load and peak load plants, load forecasting.

3. Power Plant Economics:

Capital cost of plants, annual fixed cost, operating costs and effect of load factor on cost of energy, depreciation.

4. Tariffs and power factor improvement:

Objectives of tariff making, different types of tariff for domestic, commercial, agricultural and

Industrial loads. Need for p.f. improvement, p.f. improvement using capacitors, determination of economic p.f.

5. Selection of plant:

Plant location, plant size, no. and size of units in plants, economic comparison of alternatives , annual cost , rate of return, present worth and capitalized cost methods.

6. Economic operation of steam plants:

Methods of loading turbo-generators, input- output curve, heat rate, incremental cost , method of lagrangian multiplier, effect of transmission losses, co ordination equations, iterative procedure to solve co-ordination equations.

7. Hydro-thermal co-ordination:

Advantages, combined working of run off river plant and steam plant , reservoir hydro plants and thermal plants-long term operational aspects, scheduling methods.

8. Pollution and environmental problems:

Energy and environment, Air pollution, Aquatic impacts, nuclear plant and hydro plant impacts.

9. Cogeneration:

Definition and scope, Topping and Bottoming Cycles, Benefits, cogenerationtechnologies.

Books:

1. Gupta, B.R.(2000). Generation of Electric Energy. S.Chand & Co. Delhi.

2. Dom, K. (1998) Power Plant Engineering S.Chand & Co. Delhi.

Course Name: Programmable Logic Controllers & Microcontrollers
Course Code: 103604

Semester: 6th

Credits- 04 **L T P**

3 1 0

Objective:- To learn the basic principle of operation of programmable logic controllers and ladder diagrams.

1. **Introduction to PLC**

Introduction, relative merits over hard-wired logic and relay. PLC based design of power converters, PLC based control of DC and AC Drives Process Control, Advantages, Applications Building blocks of PLC, Functions of various blocks, concept of PLC.

2. **Working of PLC**

Basic operation and principles of PLC
Architectural details processor
Memory structures, I/O structure
Programming terminal, power supply

3. **Instruction Set**

Basic instructions like latch, master control, self holding relays.
Timer instruction like retentive timers, resetting of timers.
Counter instructions like up counter, down counter, resetting of counters.
Sequencers, output sequencers, input sequencers, time driven, and event driven sequencers, masking etc.
Comparison instructions like equal, not equal, greater, greater than equal, less than, less than equal, mask equal limit etc.

4. **Ladder Diagram Programming**

Programming based on basic instructions, timer, counter, sequencer, and comparison instructions using ladder program.

RECOMMENDED BOOKS

1. Otter, J.D. (2000). *Programmable Logic Controller*. P.H. International, Inc, USA
2. Dunning, G. (1999). *Introduction to PLCs*. McGraw Hill

Course Name: Utlization of Electrical Engineering
Course Code: 103605

Semester: 6th

Credits- 04 **L T P**

3 1 0

Objective: - To understand the various applications of utilization of electrical energy like electrical heating, welding, illumination etc and Electric Traction.

1. Electric Heating:

Advantages and methods of electric heating, Resistance heating, Electric arc heating, Induction heating, Dielectric heating.

2. Electric Welding:

Electric Arc Welding, Electric Resistance welding, Electronic welding control.

3. Electrolyte Process:

Principles of electro deposition, Laws of electrolysis, applications of electrolysis.

4. Illumination:

Various definitions, Laws of illumination, requirements of good lighting, Design of in door lighting and outdoor lighting systems

5. Refrigeration and Air Conditioning:

Refrigeration systems, domestic refrigerator, water cooler, Types of air conditioning, Window air conditioner.

6. Electric Traction - I

Types of electric traction, systems of track electrification

Traction mechanics- types of services, speed time curve and its simplification, average and schedule Speeds Tractive effort, specific energy consumption, mechanics of train movement, coefficient of adhesion and its influence

7. Electric Traction – II

Salient features of traction drives, Series – parallel control of dc traction drives (bridge transition) and energy saving

Power Electronic control of dc and ac traction drives, Diesel electric traction.

Text Books:

1. Partab, H. (2000). *Art and Science of Electrical Energy.* Dhanpat Rai & Sons. Delhi

2. Partab, H. (2003). *Modern Electric Traction.* Dhanpat Rai & Sons.Delhi

3. Wadhwa, C.L. (1998). *Generation, Distribution and Utilization of Electrical Energy*. New Age International Publications. Delhi

Course Name: Estimating & Costing
Course Code: 103709

Semester: 6th

Credits- 04 **L T P**

3 1 0

Objective:- To understands the basic concepts of different types of wiring, estimating and costing of material.

1.Introduction

Purpose of estimating and costing, preformed for making estimates, preparation of materials schedule, costing, price list, tender document, net price list, market survey, overhead charges, labour charges, electrical point method and fixed percentage method, contingency, profit, purchase system, enquiries, comparative statements, orders for supply, payment of bills. Tenders – its constituents, finalization, specimen tender.

2.Types of wiring

Cleat, batten, casing capping and conduit wiring, comparison of different wiring systems, selection and design of wiring schemes for particular situation (domestic and Industrial). Selection of wires and cables, wiring accessories and use of protective devices i.e. MCB, ELCB etc. Use of wire-gauge and tables (to be prepared/arranged)

3.Estimating and Costing:

Domestic installations; standard practice as per IS and IE rules. Planning of circuits, sub-circuits and position of different accessories, electrical layout, preparing estimates including cost as per schedule rate pattern and actual market rate (single storey and multi-storey buildings having similar electrical load)

Industrial installations; relevant IE rules and IS standard practices, planning, designing and estimation of installation for single phase motors of different ratings, electrical circuit diagram, starters, preparation of list of materials, estimating and costing exercises on workshop with singe-phase, 3-phase motor load and the light load (3-phase supply system)

Service line connections: estimate for domestic and Industrial loads (over-head and under ground connections) from pole to energy meter.

4. Estimating the material required for:

Transmission and distribution lines (overhead and underground):Planning and designing of lines with different fixtures, earthing etc. based on unit cost calculations

Substation: Types of substations, substation schemes and components, estimate of 11/0.4 KV pole mounted substation up to 200 KVA rating, earthing of substations, Key Diagram of 66 KV/11KV Substation.

RECOMMENDED BOOKS

1. Gupta, J.B. (2000). *Electrical Installation, Estimating and Costing*. SK Kataria and Sons, New Delhi

2. Bhattacharya, S.K. (1998). *Estimating and Costing*. Tata McGraw Hill, New Delhi

3. Singh, Surjeet. (1999). *Estimating and Costing*. Dhanpat Rai & Co. New Delhi

Course Name: Programmable Logic Controllers Lab
Course Code: 103607

Semester: 6th

Credits- 01 **L T P**

0 0 2

LIST OF PRACTICALS

1. Familiarization with the working of PLC
2. Components/Sub-Components of a PLC, learning functions of different modules of PLC System
3. Introduction to step 5 programming language, ladder diagram concepts, instruction list syntax
4. Basic logic operations, AND, OR, NOT functions
5. Logic control systems with time response as applied to clamping operation

6. Sequence control system eg. In lifting a dence for packaging and counting
7. Wiring, entering and testing programs wiring a hand-held programmer for the following operations:
   - Ladder Logic, Timers, Counters, Sequencers
   - Wiring, entering and testing programs using computers for the following operations:
     - Ladder logic, timers, counters, sequencers
   - Assembly language programming
   - C language programming
   - Write a program for LCD interface
   - Write a program for A/D converter, result on LCD
   - Write a program for D/A convater, showing the result on LCD
   - Write a program for serial data transmission from kit to PC
8. Development of a small working programs using PLC

Course Name: Power Systems-II Lab
Course Code: 103612

Semester: 6th

Credits- 01 **L T P**

0 0 2

List of experiments:

1. To study the performance of a transmission line. Also compute its ABCD parameters.

2. Study of Characteristics of over current and earth fault protection.

3. To study the operating characteristics of fuse. (HRC or open type)

4. To find the earth resistance using three spikes

5. To study over current static relay.

6. To study the different types of faults on transmission line demostration panel/model.

7. To study the performance of under voltage and over voltage relay.

8. To study the characteristics of bimetal mini circuit breakers.

9. To study the characteristics of Distance Relay.

10. To find the breakdown strength of transformer oil.

Course Name: Minor Project
Course Code: 103609

Semester: 6th

Credits- 01 **L T P**

0 0 2

Electrical estimation and costing of electrical installations in domestic, commercial and industrial sector:

Installation plans, single line representation, wiring diagrams, list of materials required with specifications,

Protective devices and earthing practices.

Estimation and costing for installation / erection of a typical transmission line.

Course Name: Electrical Machines – II Laboratory

Course Code: 103610

Semester: 6th

Credits- 01 **L T P**

0 0 2

List of experiments:

1. To Perform load-test on 3 ph. Induction motor and to plot torque V/S speed

Characteristics.

2. To Perform No-load & blocked –Rotor tests on 3 ph. Induction motor to obtain equivalent ckt. Parameters & to draw circle diagram.

3. To study star- delta starters physically and

(a) to draw electrical connection diagram

(b) to start the 3 ph. Induction motor using it.

(c) To reverse the direction of 3 ph. I.M.

4. To start a 3 phase slip –ring induction motor by inserting different levels of resistance in the rotor circuits and to plot torque –speed characteristics.

5. To perform no-load & blocked –rotor test on 1 ph. Induction motor & to determine the parameters of equivalent ckt. drawn on the basis of double revolving field theory.

6. To Perform load –test on 1 ph. Induction motor & plot torque –speed characteristics.

7. To Perform no load & short circuit test on 3- phase alternator and draw open circuit and short circuit characteristics.

8. To find voltage regulation of an alternator by zero power factor (z.p.f.) method.

9. To study effect of variation of field current upon the stator current and power factor with synchronous motor running at no load and draw V & inverted V curves of motor.

10. To measure negative sequence & zero sequence reactance of Syn. Machines.

Course Name: 6 Months Industrial Training

Course Code: 103610

Semester: 7th

Credits- 20 **L T P**

0 0 0

7th Semester

(103701):

Six month in an Industry in the area of Electrical Engineering. The summer internship should give exposure to the practical aspects of the discipline. In addition, the student may also work on a specified task or project which may be assigned to him/her. The outcome of the internship should be presented in the form of a report. The student will make a presentation based upon the Industry Internship attended. Performance to be rated as Satisfactory/Un -Satisfactory (S/US). For unsatisfactory the internship to be repeated.

Course Name: Computer Aided Power System Analysis

Course Code: 103810

Semester: 8th

Credits- 04 **L T P**

3 1 0

1. SYSTEM MODELLING:
System modeling of synchronous machines, transformers, loads etc, per unit impedance, single line diagram of electrical networks, single phase impedance diagrams corresponding to single line diagram. Formation of impedance and admittance matrices for the electrical networks.

2. LOAD FLOW STUDIES:
Data for the load flow studies, Swing Bus, Formulation of simultaneous equations, Iterative solutions by the Gauss-Seidal Method & by Newton Raphson Method.

3. FAULT ANALYSIS:
Transients on transmission line, short circuit of synchronous machine, selection of circuit breakers, Algorithm for short circuit studies, Symmetrical Component transformation, construction of sequence networks of power systems. Symmetrical Analysis of Unsymmetrical LG, LL, LLG faults using symmetrical components.

4. POWER SYSTEM STABILITY:
Steady state stability, Dynamics of a synchronous machine, Power angle equations, Transient Stability, equal area criterion, Numerical solution of swing equation, factors effecting transient Stability.

Books :

1. Elgerd, O.I. (1999*). Electric Energy Systems Theory*, TMH
2. Nagrath,I.J. Kothari, D.P. (2003). *Modern Power System Analysis*. TMH

3. Stevenson, W.D. (2003). *Elements of Power System Analysis.* McGraw Hill

Course Name: Extra High Voltage Engineering

Course Code: 103802

Semester: 8th

Credits- 04 **L T P**

3 1 0

E.H.V. Transmission and Corona Loss:
Need for EHV Transmission. Use of bundled conductors, corona characteristics of smooth bundled conductors with different configurations, Corona loss. Factors affecting the corona loss. Radio interference due to corona. Shunt and series compensation in EHV lines. Tuned power lines. Insulation Co-ordination.

HVDC Transmission:
Advantages, disadvantages and economics of HVDC Transmission system. Types of D.C. links, converter station equipment, their characteristics.

Insulating materials used in H.V. Engg.:
Applications of insulating materials used in power transformers rotating machines, circuit breakers, cables, power capacitors. Conduction and breakdown in Gases, Liquids & Solid

Dielectrics:
Solids
- Intrinsic, electromechanical and thermal breakdown composite dielectrics, solid Dielectrics used in practice.
Liquids:-
Conduction and breakdown in pure and commercial liquids, suspended particle theory, cavitation and bubble theory, stressed oil volume theory, Liquids used in practice.
Gases:-
Ionization process, Townsend's current growth equations, Ist and 2^{nd} ionization coefficients. Townsend's criterion for breakdown. Streamer theory of breakdown, Pashen's law of Gases. Gases used in practice.

Generation of High Voltages:
D.C., A.C. (Power frequency and High frequency) Impulse voltage and impulse currentGeneration Tripping and contact of Impulse Generator. Test procedures in H.V. Engg. Lab. Testing of cables, insulators, bushings, circuit breakers and transformers.

References:

1. Bagamudre, R.D. (2000). *E.H.V. A.C. Transmission Engg.* New Age International Publishers.

Course Name: Non Linear Digital Control Systems

Course Code: 103803

Semester: 8th

Credits- 04 **L T P**

3 1 0

STATE VARIABLE TECHNIQUES :
State variable representation of systems by various methods, solution of state variable model. Controllability and observability.

PHASE PLANE ANALYSIS:
Singular points, Method of isoclines, delta method, phase portrait of second order nonlinear systems, limit cycle.

DESCRIBING FUNCTION ANALYSIS :
Definition, limitations, use of describing function for stability analysis, describing function of i deal relay, relay with hysteresis, dead zone, saturation, coulomb friction and backlash.

LYAPUNOV'S DIRECT METHOD :
Lyapunov's direct method, generation of Lyapunov's function by Krasovskii's and Variable Gradient methods

SAMPLED DATA SYSTEMS:
Sampling process, mathematical analysis of sampling process, application of Laplace transform. Reconstruction of sampled signal, zero order, first order hold. Z-transform definition, evaluation of Z-transform, Inverse Z-transform, Pulse transfer function, limitations of Z-transform, State variable formulation of discrete time systems, Solution of discrete time state equations. Stability definition, Jury's test of stability, extension of Routh-Hurwitz criterion to discrete time systems.

Course Name: Computer Aided Power System Analysis Lab

Course Code: 103808

Semester: 8th

Credits- 01 **L T P**

0 0 2

List of Experiments:

1. Developing a Single line Diagram of a Power System Using Computer Software.
2. Developing Algorithms/Flowcharts/Computer programmes for:

I. Load Flow Studies using
(a) Gauss Siedel Method
(b) Newton Raphson's Method
(c) Fast Decoupled Method

II. Short Circuit Studies for
(a) Symmetrical Faults
(b) Line to Ground Fault
(c) Line to Line Faults etc.

III Swing Equation for Transient Stability Studies

IV. Economic Load Dispatch.

Course Name: Major Project

Course Code: 103805

Semester: 8th

Credits- 02 **L T P**

0 0 4

Project Work Related To:
Design, Fabrication, Simulation, Evaluation, Testing etc. of any Electrical Equipment/System is to be carried out under the supervision of guide(s).

CO5	2	2	2	1	2	1	1	2	2	2	2

Course Name: Seminar

Course Code: 103805

Semester: 8th

Credits- 01 **L T P**

0 0 2

Students will be required to prepare a report on a given topic related to latest developments in

Electrical Engineering and deliver a seminar on that topic

Course Name: High Voltage Direct Current Transmission

Course Code: 103807

Semester: 8th

Credits- 04 **L T P**

3 1 0

Direct Current (DC) power transmission technology:
Introduction, comparison of Alternating Current (AC) and Direct Current (DC) transmission, application of DC transmission, application of DC transmission, description of DC transmission system, Configurations, planning for High Voltage Direct Current (HVDC) transmission, modern trends in DC transmission. Introduction to Device: Thyristor valve, valve tests, recent trends.

Analysis of High Voltage Direct Current (HVDC) converters:
Pulse number, choice of converter configuration, simplified analysis of Graetz circuit, converter bridge characteristics, characteristics of a twelve -pulse converter, detailed analysis of converters with and without overlap.

Converter and HVDC system control:
General, principles of DC link control, converter control characteristics, system control hierarchy, firing angle control, current and extinction angle control, starting and stopping of DC link, power control, higher level controllers, telecommunication requirements.

Converter faults and protection:
Introduction, converter faults, protection against over-currents, over-voltages in a converter station, surge arresters, protection against over-voltages.

Smoothing reactor and DC line:
Introduction, smoothing reactors, DC line, transient over voltages in DC line, protection of DC line, DC breakers, Monopolar operation, effects of proximity of AC and DC transmission lines.

Component models for the analysis of AC/DC systems:
General, converter model, converter control, modelling of DC network, modelling of AC network.

References:
1. Bagamudre, R. D. (2000). *E.H.V. A.C. Transmission Engg*. New Age International Publishers.

Course Name: Cellular & Mobile Communication

Course Code: 104601

Semester: 8th

Credits- 04 **L T P**

3 1 0

Introduction to Cellular Mobile Systems:
A basic cellular system, performance criteria, uniqueness of mobile radio environment, operation of cellular systems, planning a cellular system, analog & digital cellular systems.

Cellular Wireless Communication Systems:
Second generation cellular systems: GSM specifications and Air Interface - specifications of various units, 2.5 G systems: GPRS/EDGE specifications and features, 3G systems: UMTS & CDMA 2000 standards and specifications

Elements of Cellular Radio Systems Design:
General description of the problem, concept of frequency reuse channels, co-channel interferenc e reduction factor, desired C/I from a normal case in an omni directional antenna system, cell splitting, consideration of the components of cellular systems.

Interference:
Introduction to co-channel interference, real time co-channel interference, co-channel measurement design of antenna system, antenna parameter and their effects, diversity receiver in co-channel interference – different types.

Cell Coverage for Signal & Traffic:
General introduction, obtaining the mobile point to point mode, propagation over water or flat open area, foliage loss, propagation near in distance, long distance propagation, point to point prediction model-characteristics, cell site, antenna heights and signal coverage cells, mobile to mobile propagation.

Cell Site Antennas and Mobile Antennas:
Characteristics, antenna at cell site, mobile antennas, Frequency Management and Channel Assignment, Frequency management, fixed channel assignment, non-fixed channel assignment, traffic & channel assignment.

Hand Off, Dropped Calls:
Why hand off, types of handoff and their characteristics, dropped call rates & their evaluation.

Operational Techniques:
Parameters, coverage hole filler, leaky feeders, cell splitting and small cells, narrow beam concept.

Recommended Text Books:
1. William, C Y Lee. (2000). *Mobile Cellular Telecommunications*. McGraw Hill

2. Rappaport, T.S. (1999). *Wireless Communication, principles & practice.* PHI

Course Name: Power System Planning

Course Code: 103808

Semester: 8th

Credits- 04 **L T P**

3 1 0

1. Introduction :
Review of load forecasting, the electric utility industry, growth characteristics generation, transmission and distribution systems.

2. Generation System Planning:
Optimal Scheduling of Generation units, Optimal Power Flow, Optimal Scheduling of hydor-thermal power system, Unit commitment, Reliabilitybased generation system, expansion planning, unit maintenance schedule, unit effective load carrying capability, eneration system cost analysis.

3. Transmission System Planning :
Automatic Transmission System Expansion Planning, Automatic Transmission Planning using Interactive Graphics.

4. Distribution System Planning and Automation:
Load Characteristics, Design of Subtransmission lines and distribution, substations, Design Considerations of Primary and secondary distribution systems, Voltage drop and power loss Calculations, Distribution system Voltage regulation, application of capacitors to distribution systems.

Recommended Books

1. Sullivan, R.L. (1999). *Power System Planning.* McGraw Hill International Book Co.
2. Pabla, A.S. (1998). *Electrical Power System Planning*. Macmillan.

Course Name: Total Quality Management

Course Code: 105918

Semester: 8th

Credits- 04 **L T P**

3 1 0

1. Quality and Total Quality Management; Excellence im manufacturing/service, factors of excellence, relevance of TQM.

2. Concept and definition of quality; total quality control (TQC) and Total Quality Management (TQM), salient features of TQC and TQM. Total Quality Management Models, benefits of TQM.

3. Just-in-time (JIT): Definition: Elements, benefits, equipment layout for JIT system, Kanban system MRP (Material Requirement planning) vs. JIT system, Waste elimination, workers involvement through JIT: JIT cause and effect chain, JIT implementation.

4. Customer: Satisfaction, data collection and complaint, redressed mechanism.

5. Planning Process: Policy development and implementation; plan formulation and implementation.

6. Process Management: Factors affecting process management, Quality function development (QFD), and quality assurance system.

7. Total Employees Involvement (TEI): Empowering employees: team building; quality circles; Reward and Recognition; education and training, Suggestion schemes.

8. Problems solving Defining problem; Problem identification and solving process; QC tools.

9. Benchmarking definition, concept, process and types of benchmarking.

10. Quality Systems: Concept of quality system standards: relevance and origin of ISO 9000; Benefits; Elements of ISO 9001, ISO 9002, ISO 9003.

11. Advanced techniques of TQM: Design of experiments: failure mode effect analysis: Taguchi methods

BOOKS:

1. Sunder, R. (2001). *Total Quality Management*. Tata McGraw Hill
2. Zairi M. (2000). *TQM for Engineers.* Aditya Books

Course Name: HUMAN RESOURCE MANAGEMENT

Course Code: 102602

Semester: 8th

Credits- 04 **L T P**

3 1 0

Introduction: Meaning, scope, objectives and importance of Human Resource Management, Personnel Management, its functions, policies & roles, Organizing the Human Resource Management department in the organization, Human Resource Management practices in India, HR audit.

Procurement and Placement: Need for Human Resource Planning; Process of Human Resource Planning; Methods of Recruitment; Psychological tests and interviewing, Meaning and Importance of Placement and Induction, Employment Exchanges (Compulsory Notification of vacancies) Act 1959, The Contract Labor (Regulation & Abolition) Act 1970.

Training & Development: Principles of Training and Development; Difference between Training and Development; Promotion: Promotion-Merit v/s seniority wise; Performance Appraisal, Career Development & Planning.

Job analysis & Design: Job Analysis and its Principle: Job Specification & Job Description, Difference between Job Specification Job Description.

Job Satisfaction: Meaning, objectives and importance Job satisfaction;

Motivation: Factors affecting motivation, Motivation Theory: Maslow's Motivation Theory, Hertzberg Hygiene Theory; Workers ' Participation in the organization, Quality of work life.

Bonus and Incentives: Meaning, objectives and importance of Bonus and Incentives.

The Wage Act and Compensation Function: Basic concepts in wage administration, company's wage policy, Issues in wage administration, Payment of Wages Act-1936, Minimum Wages Act-1961.

Integration and Human Relation: Meaning, objectives and importance of Integration in industry. Human Relations and Industrial Relations; Difference between Human Relations and Industrial Relations, Factors required for good Human Relation Policy in Industry;

Employees Grievances: Employee Employer relationship Causes and Effects of Industrial disputes;, Administration of Discipline, Absenteeism, Labor Turnover, Changing face of the Indian work force and their environment, Importance of collective Bargaining; Role of trade unions in maintaining cordial Industrial Relations.

Welfare of Employees: Welfare of Employees and its Importance; Fringe & retirement terminal benefits, administration of welfare amenities, Meaning and Importance of Employee Safety, Accidents-Causes & their Prevention, Safety Previsions under the Factories Act 1948;, Social security, Family Pension Scheme, ESI act 1948, Future challenges for Human Resource Management.

Text Books:

1. Chhabra, T.N. (2000). *Human Resource Management.* Dhanpat Rai & Co.

Reference Books:

1. Lowin B. Flippo. (1998). *Principles of personnel Management.* Mc Graw-Hill.

2. Saxena, R.C. (2003). *Labour Problems and social welfare*. K.Math & Co.

3. Minappa, A. and Saiyada, M. S. (1997). *Personnel Management.* Tata Mc. Graw-Hill.

Course Name: Non – Conventional energy Sources

Course Code: 103809

Semester: 8th

Credits- 04 **L T P**

3 1 0

INTRODUCTION: Limitation of conventional energy sources, need and growth of alternative energy source, basic scheme and application of direct energy conservation.

MHD GENERATORS: Basic principles, gaseous, conduction and hall effect, generator and motor effect, different types of MHD generator, types of MHD material, conversion effectiveness, analysis of constant area MHD generator, practical MHD generator, application and economic aspects.

THERMO-ELECTRIC GENERATORS: Thermoelectric effects, Seeback effect, Peltier effect, Thomson effect, thermoelectric converters, figures of merit, properties of thermoelectric material, brief description of the construction of thermoelectric generators, application and economic aspect.

PHOTO VOLTAIC EFFECT AND SOLAR ENERGY: Photovoltaic effect, different types of photovoltaic cells, cell fabrication, characteristics of photovoltaic cells, conversion efficiency, solar batteries, application, solar radiation analysis, solar energy in India, solar collectors, solar furnaces and applications.

FUEL CELLS: Principle of action, Gibb's free energy, general description of fuel cells, types, construction, operational characteristics and application.

MISCELLANEOUS SOURCES: Geothermal system, characteristic of geothermal resources, choice of generator set, electric equipment precautions low hydro-plants, definition of low head hydrometer, choice of site, choice of turbine wind power, history of wind power, wind machines, theory of wind power, characteristic of suitable wind power site, tidal energy, idea of tidal energy, tidal electric generator.

Books:

1. Rai, G. D. (2000). *Non Conventional Energy Sources.* Khan
2.
3. na Publishers.

Total Number of Course	67
Number of Theory Course	38
Number of Practical Course	29
Total Number of Credits	**232**

Aneexure-3

ACADEMIC INSTURCTIONS

Attendance Requirements A student shall have to attend 75% of the scheduled periods in each course in a semester; otherwise he / she shall not be allowed to appear in that course in the University examination and shall be detained in the course(s). The University may condone attendance shortage in special circumstances (as specified by the Guru Kashi University authorities). A student detained in the course(s) would be allowed to appear in the subsequent university examination(s) only on having completed the attendance in the program, when the program is offered in a regular semester(s) or otherwise as per the rules.

Assessment of a course

Each course shall be assessed out of 100 marks. The distribution of these 100 marks is given in subsequent sub sections (as applicable).

	Internal (50)						**External (50)**	**Total**
Components	**Attendance**	**Assignment**			**MST 1**	**MST2**	**ETE**	
		A1	A2	A3				
Weightage	10	10	10	10	30	30	50	
Average Weightage	10	10			30		50	100

Passing Criteria

The students have to pass both in internal and external examinations. The minimum passing marks to clear in examination is 40% of the total marks.