UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Mathematics-III
Course Code: M401
L-T Scheme: 3-1 **Course Credits: 4**

Introduction:

The goal of this mathematics course is to provide high school students and college freshmen an introduction to basic mathematics and especially show how mathematics is applied to solve fundamental engineering problems. The Topics to be covered (tentatively) include:

Fourier Series & Fourier Transform.

Introduction to Functions of a Complex Variable & Conformal Mapping.

Basic Probability Theory.

Partial Differential Equation (PDE) and Series solution of Ordinary Differential Equation (ODE).

Course Objectives:

In this course, the students will learn differentiation and integration of Complex functions and mappings in the complex plane. They are introduced to Fourier Transforms to stimulate interest in communications, control and signal processing to prepare them for follow up courses in these areas. They also learn to extend and formalize knowledge of the theory of probability and random variables and get motivated to use of statistical inference in practical data analysis. They are also introduced to Partial Differential Equations, their types and solutions.

Learning Outcomes:
Knowledge:

At the end of this course, students will be able to

1. Understand and analyze analytic functions, evaluate lineintegrals of complex functions.
2. Apply fundamental mathematical properties of the Fouriertransform including linearity, shift, symmetry, scaling,modulation and convolution and calculate the Fourier transformor inverse transform of periodic functions.
3. Construct probability distributions of a random variable based on real world situation and use it to compute the mean and variance; approximate a given data to fit a curve and analyze and interpret the correlation between two sets of data.
4. Form PDE by eliminating arbitrary constants / functions and solvelinear PDEs by direct method and separation of variables.

Application:

1. Fourier transforms (FT) take a signal and express it in terms of the frequencies of the waves that make up that signal.
2. Probability is used in Weather forecasting, calculatingand in many more engineering applications.
3. At the end of this course the student should be able to apply the above mentioned concepts to engineering problems.

Course Contents:

Unit 1:**Fourier Series & Fourier Transform :** Introduction, Periodic functions: Properties, Even & Odd functions: Properties, Euler's Formulae for Fourier Series, Fourier Series for functions of period 2π, Fourier Series for functions of period $2l$, Dirichlet's conditions, Sum of Fourier series. Theorem for the convergence of Fourier Series (statement only). Fourier Series of a function with its periodic extension. Half Range Fourier series: Construction of Half Range Sine Series, Construction of Half Range Cosine

Series. Fourier Integral Theorem (statement only), Fourier Transform of a function, Fourier Sine and Cosine Integral Theorem (statement only), Fourier Cosine & Sine Transforms. Fourier, Fourier Cosine & Sine Transforms of elementary functions. Properties of Fourier Transform: Linearity, Shifting, Change of scale, Modulation. Fourier Transform of Derivatives. Convolution Theorem (statement only), Inverse of Fourier Transform.

Unit 2:**Introduction to Functions of a Complex Variable & Conformal Mapping:** Complex functions, Concept of Limit, Continuity and Differentiability. Analytic functions, Cauchy-Riemann Equations (statement only). Sufficient condition for a function to be analytic. Harmonic function and Conjugate Harmonic function, related problems. Construction of Analytic functions: Milne Thomson method, related problems.

Unit 3Basic Probability Theory: Classical definition and its limitations. Axiomatic definition. Some elementary deduction: i) P(O)=0, ii) $0 \leq P(A) \leq 1$, iii) P(A')=1-P(A) etc. where the symbols have their usual meanings. Frequency interpretation of probability. Addition rule for 2 events (proof) & its extension to more than 2 events (statement only). Related problems. Conditional probability & Independent events. Extension to more than 2 events (pairwise & mutual independence). Multiplication Rule. Examples. Baye's theorem (statement only) and related problems.

Definition of random variable. Continuous and discrete random variables. Probability density function & probability mass function for single variable only. Distribution function and its properties (without proof). Definitions of Expectation & Variance, properties & examples. Some important discrete distributions: Bernoulli, Binomial & Poisson distributions and related problems. Some important continuous distributions: Normal distributions and related problems.

Unit 4Partial Differential Equation (PDE) and Series solution ofOrdinary Differential Equation (ODE): Basic concepts of PDE. Origin of PDE, its order and degree, concept of solution in PDE. Introduction to different methods of solution: Separation of variables, Laplace & Fourier transforms methods.

Solution of Initial Value & Boundary Value PDE's by Separation of variables, Laplace &Fourier transform methods.

PDE I: One dimensional Wave equation.
PDE II: One dimensional Heat equation.
PDE III: Two dimensional Laplace equation.

Text Books

1. Engineering Mathematics-III(B.K Pal and K.Das) [All course]

Reference Books:

1. Brown J.W and Churchill R.V: Complex Variables and Applications, McGraw-Hill.
2. Das N.G.: Statistical Methods, TMH.
3. Grewal B S: Higher Engineering Mathematics, Khanna Publishers.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Basic Environmental Engineering
Course Code: CH401
L-T Scheme: 2-1 **Course Credits: 3**

Introduction:

This course introduces the basic principles behind the environmental phenomena and how anthropogenic activities are affecting those environmental processes. The different administrative measures taken to safeguard our environment are also discussed in this course. The Topics to be covered (tentatively) include:

- Ecology
- Air pollution and control
- Water Pollution and Control
- Land Pollution
- Noise Pollution
- Environmental Management

Objectives:

In this course we will study about the pattern of growing human population and its effect on the planet. We will be familiarizing with the consequences of anthropogenic activities and measures to mitigate their harmful effects. We will learn about the mechanism behind the global issues like global warming, acid rain, water pollution, etc.

Learning Outcomes:

Knowledge:

1. To introduce the patterns of population growth and associated problems.
2. To familiarize with the cause, effect and control measures of various human made degrading processes.
3. To enable the students to know the mechanism behind the devices to control pollution.
4. To familiarize with administrative laws to mitigate various environmental problems.

Application:

1. To understand the problems associated with pollution
2. To familiarize with the global environmental issues.
3. To understand the principles behind various control devices.
4. To understand and comply with the various government environmental laws.

Course Contents:

Unit 1: Introduction, Ecology, Air pollution and control

Unit 2: Water Pollution and Control

Unit 3: Land Pollution, Noise Pollution

Unit 4: Environmental Management

Text Books

1. Gourkrishna Damohapatra, Basic Environmental Engineering and Elementary Biology, Vikas publishing.

References

1. A.K. De, Environmental Chemistry, New Age International.

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UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Data Structure & Algorithm
Course Code: CS(EE)401
L-T Scheme: 3-1 **Course Credits: 3**

Introduction:

This course examines data structures and algorithms basics. The Topics to be covered (tentatively) include:

- Abstract Data Type and Data Type
- Time and space analysis of algorithms
- Linear Data structures
- Non-linear Data structures
- Sorting, Searching and Hashing

Objectives:

In this course we will study the basic components of data structure and algorithm.Students are expected to be capable of understanding the data structures, their advantages and drawbacks, how to implement them in C, how their drawbacks can be overcome and what the applications are and where they can be used. The way different modules in the operating system interact and work together to provide the basic services of an operating system.

Learning Outcomes:

Knowledge:

1. To learn about the data structures/ methods/algorithms mentioned in the course with a comparative perspective so as to make use of the most appropriate data structure/ method/algorithm in a program to enhance the efficiency (i.e. reduce the run-time) or for better memory utilization, based on the priority of the implementation.
2. To understand at least the efficiency aspects of the graph and sorting algorithms covered in this course.
3. To convert an inefficient program into an efficient one using the knowledge gathered from this course.

Application:

1. To implement different types of linked list.
2. To implement graph algorithm for any network
3. To implement sorting and searching.

Course Contents:

Unit 1: Introduction-Data and data structure, Abstract Data Type and Data Type. Algorithm efficiency and analysis, time and space analysis of algorithms – order notations.

Unit 2: Linear Data structures–Array, Linked List, Stack, Queue and Recursion with their types, different operations and applications

Unit 3: Nonlinear Data structures–Graph, Trees, Minimum spanning treewith their types, different operations and applications.

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Unit 4: Sorting, Searching and Hashing- Bubble sort and its optimizations, insertion sort, shell sort, selection sort, merge sort, quick sort, heap sort (concept of max heap, application – priority queue), radix sort. Sequential search, binary search, interpolation search. Hashing functions, collision resolution techniques.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Text Books

1. YashavantKanetkar, Abduln A.P.J. Kalam," Data Structure Through C",2nd edition, BPB Publications
2. Seymour Lipschutz, "Data Structures",Revised First edition,McGraw Hill Education.

References

1. Langsam,Augestein, Tenenbaum:Data Structures using Cand C++, 2nd Edn, 2000,
2. Horowitz and Sahani:Fundamental ofData Structuresin C,2nd Edn, 2008
3. Kruse, Tonso, Leung: Data Structures and ProgramDesign in C, 2000
4. Richard F.Gilberg&BehrouzForouzan: Data Structures, APseudocodeApproach withC, 2001.
5. Weiss: DataStructures and AlgorithmAnalysis in C/C++, 3rd Edn, 2006

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Thermal Power Engineering
Course Code: ME (EE) 401
L-T Scheme: 3-0 **Course Credits: 3**

Introduction:

Thermal power Engineering related to the thermal power plant. Weather it is boiler, compressor, turbine, site selection of plant, economics of thermal power plant. Lay out of plant etc.

Objectives:

1. Describe sources of energy and types of power plants.
2. Analyze different types of steam cycles and estimate efficiencies in a steam power plant.
3. Describe basic working principles of gas turbine and diesel engine power plants.
4. Define the performance characteristics and components of such power plants.
5. List the principal components and types of nuclear reactors.
6. Classify different types of coupled vapor cycles and list the advantages of combined cycles power plant.
7. List different types of fuels used in power plants and estimate their heating values.
8. List types, principles of operations, components and applications of steam turbines, steam generators, condensers, feed water and circulating water systems.
9. Estimate different efficiencies associated with such systems.

Learning Outcomes:

After completion of this course, the students should be able to:

1. Discuss the energy resources and energy conversion methods available for the production of electric power in India.
2. Determine the efficiency and output of a modern Rankine cycle steam power plant from given data, including superheat, reheat, regeneration, and irreversibilities
3. Calculate the heat rate, fan power consumption, flame temperature and combustion air requirements of conventional steam generators (boilers).
4. Select the heat transfer tubes needed for condensers and feed water heaters
5. Explain the blade shapes, and calculate work output of typical turbine stages.
6. Calculate the performance of gas turbines with reheat and regeneration, and discuss the performance of combined cycle power plants.
7. Explain the basic principles of thermal-fission and fast-breeder nuclear power plants,such as pressurized-water, boiling-water, and heavy-water reactors.

Course Contents:
Module -I

Course Description

WaterTube&FireTubeboilers,CirculatingPrinciples,ForcedCirculation,Criticalpressure,Superheaters, Reheaters, attemperators, induced draught,forced draught and secondary air Fans, Boiler performance analysis and heat balance. Combustion Systems, Environmental Protection– ESP ,Cyclone Separator ,Dust Collector etc.

Module -II

Rotary Thermodynamic devices – Steam turbines &their classifications – Impulse &Reaction type Turbines, Thermodynamics of compressible fluid-flow, equation and continuity– Isentropic flow through nozzles, velocity diagram,

Module -III

Blade efficiency, optimum velocity ratio, multi-staging, velocity & pressure compounding, losses in turbines, erosion of turbine blades, turbine governing, performance analysis of turbine, Condensing system.

Module -IV

IC Engines – classification. Analysis of a standard cycle, fuel characteristic of SI &CI Engine, Combustion, Engine performance. Automotive Engine exhaust emission and their control.

Module -V

Gas turbine Analysis– Regeneration Reheating, Isentropic efficiency. Combustion efficiency.

TEXT BOOK:

1. Nag. P.K., “Power Plant Engineering”, Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.
2. . P.K.Nag-EngineeringThermodynamics–TMH

REFERENCES:

1. El-Wakil. M.M., “Power Plant Technology”, Tata McGraw – Hill Publishing Company Ltd., 2010.
2. Black & Veatch, Springer, “Power Plant Engineering”, 1996.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, “Power Plant Engineering”, Second Edition, Standard Handbook of McGraw – Hill, 1998.
4. Godfrey Boyle, “Renewable energy”, Open University, Oxford University Press in association with the Open University, 2004.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Electrical Machines-I
Course Code: EE401
L-T Scheme: 3-1 **Course Credits: 4**

Introduction:

This course examines basic operating principle and in depth concept analysis of various electrical machines. The Topics to be covered (tentatively) include:

- Operating principle of DC Machines, 3-phase induction motor&3-phase Transformer
- Parameter estimationof various electrical machines
- Analysis of various operations of electrical machines
- Domestic and industrial applications of electrical machines
- Different control methods and testing of electrical machines

Objectives:

In this course we will be familiarize and study the constructional details, principle of operation, expressions for generated voltage and torque of DC machines and predict performance characteristics and gain knowledge on speed control techniques of DCmotors.Estimationof various losses takes place in D.C. machines and to study the different testing methods. Study the working principles of three phase transformers and appreciate the testing procedures. The constructional details, principle of operation, expressions for generated voltage and torque,prediction of performance equation, torque slip characteristics and gain knowledge on speed control techniques of a 3-phase induction motor will also be familiarized and studied.

Learning Outcomes:

Knowledge:

1. Learn how to employ excitation circuit for DC generator.
2. Become adept at using various methods of reducing the armature reaction.
3. Understand the different types of generator behaviors with their V-Icharacteristics.
4. Develop the capability to analyze the concepts and applications different types of Dc machines.
5. Learn the primitive concepts of different types of speed control & necessity of speed control of DC motor.
6. Know the fundamental concepts of three phase transformer & types based on construction
7. Understand the working of transformer with & without load
8. Learn how to draw equivalent circuits of transformer with respect to primary / secondary
9. Learn about parallel operation of three phase transformer & its requirements
10. Understand why auto transformer (variac) is much used in industries.
11. Learn the primitive concepts of different types of speed control & necessity of speed control for a 3-phase induction motor.
12. Understanding of constructional details and basic operating principle of a 3-phase Induction motor.
13. Development of equivalent circuit diagram and analysis of torque slip characteristics & power slip characteristics of 3-phase induction motor.
14. Explanation of various testing to estimate the different electrical parameter of 3-phase induction motor

Application:

1. To develop, an intuitive understanding of the importance of dc machinefor various industrial purpose
2. To develop, an ability to discriminate between performance of 3-phase and 1-phase transformer with industrial and domestic load.
3. To learn different types of speed control & necessity of speed control for a 3-phase induction motor when used in plants for different types of load profile.

4. To Formulate and solve problems related to DC machines, 3-phase transformers and 3-phase induction motor.

Course Contents:

Unit 1: Electromechanical Energy Conversion Principle, Singly Excited Magnetic System and Doubly Excited Magnetic system. Physical concept of torque production; Electromagnetic torque and Reluctance torque. Concept of General terms pertaining to Rotating Machines: Electrical & Mechanical degree, Pole pitch, Coil, Generated EMF in full pitched coil, Generated EMF in a short pitched coil, EMF polygon, Distribution factor, Pitch factor. MMF produced by Distributed Windings, MMF of a coil, MMF of single phase distributed Winding.

Unit 2: 3-phase Transformers–Determination of polarity and connections ;(Star/star, star/delta, delta/star, star/zigzag, delta/zigzag, open delta), phasor groups. Effects of unbalanced loading, production ofharmonic in transformers and their suppression.3- phase to 2- phase transformation, Scott connection, 3-phase to six phase connections: double star & double delta.
3-winding transformers: parameter estimation, Applications. Parallel operation of transformer. Introduction to tap changers and their functions.

Unit 3: DC Machines – Review of construction, derivation ofEMF equation & types of excitation.Armature reaction and its effect on the performance, methods adopted for compensation of armaturereaction. Characteristics of DC generator: separately excited, shunt, series and compound generators.
Compensating winding, Commutation and function of commutators. Improvement of commutation.
Review of types of DC motors. Torque equation, speed torque characteristics: shunt, series and compound motors.Starting & speed control of DC motors. 3- Point starter & its step calculation. Speed control by controllingarmature resistance, field excitation and armature voltage. Ward- Leonard method of speed control.Losses & efficiency of DC machines, Hopkinson's & Swinburne's test.

Unit 4: 3-phase Induction motor –Types, construction, rotating magnetic field, principle of operation, slip,development of equivalent circuit. Performance equations, torque slip characteristics & power slip characteristics. Parameter estimation. Starting and speed control of Induction motors.
FluxandMMFphasors in Inductionmotors,

Text Books

1. Ashfaq Husain, "Electric Machines", Dhanpat Rai & Co.

References

1. I.J. Nagrath& D.P. Kothari , "Electric Machines", Tata Mc Graw Hill.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Electrical & Electronic Measurement
Course Code: EE402
L-T Scheme: 3-0 **Course Credits: 3**

Introduction:

This course gives fundamentals of different measuring techniques, working principle of instrument transformer, concept of CRO, Knowledge of sensors and transducers. The Topics to be covered (tentatively) include:

- Measurement methods
- Analog meters
- Instrument transformer
- Measurement of Power, Energy, resistance
- Potentiometer
- Cathode ray oscilloscope(CRO)
- Sensors &Transducers

Objectives:

The objective of the course is to to introduce the student fundamentals of Electronics Instruments and Measurement, providing an in-depth understanding of analog and digital meters, to learn the role of sensors and transducers in real life applications.

Knowledge:

1. Providing an in-depth understanding of Measurement errors.
1. Learning the necessity of measuring devices and also proper selection of the
2. Effects of the internal impedances of meters while measuring
3. Working principle of different types of analog instruments.
4. Operating principle and practical use of current transformer and potential transformer
5. Knowledge of using bridges to measure inductance capacitance resistances
6. Learning the application of ac and dc potentiometer to measure unknown emf
7. Understand the fundamental concepts of CRO and it's use to measure electrical parameters
8. Knowledge of sensors and transducers and their real time application

Application:

1. Analog and digital meters are used for measuring different electrical quantities.
2. No other instrument in electronic industry is as versatile as a CRO for measuring and recording purpose
3. Transducers are used in electronic communications systems to convert signals of various physical forms to electronic signals, and vice versa.

Course Contents:

Unit 1:

Measurements: Method of measurement, Measurement system, Classification of instruments, Definition of accuracy, Precision, Resolution, Speed of response, Error in measurement, Classification of errors, loading effect due to shunt and series connected instruments.

Analog meters: General features, Construction, Principle of operation and torque equation of Moving coil, Moving iron, Electrodynamometer, Induction instruments
Principle of operation of the Electrostatic, Thermoelectric, Rectifier type instruments, Extension of instrument ranges and multipliers.

Unit 2:

Instrument transformer: Disadvantage of shunt and multipliers, Advantage of Instrument transformers, Principle of operation of Current & Potential transformer, errors.

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Course Description

Measurement of Power: Principle of operation of Electrodynamic & Induction type wattmeter. Wattmeter errors.

Measurement of resistance:
Measurement of medium, low and high resistances, Megger.

Unit 3:

Measurement of Energy:
Construction, theory and application of AC energy meter, testing of energy meters.

Potentiometer:
Principle of operation and application of Crompton's DC potentiometer, Polar and Co-ordinate type AC potentiometer. Application.

ACBridges:
Measurement of Inductance, Capacitance and frequency by AC bridges.

Unit 4:

Cathode ray oscilloscope(CRO):
Measurement of voltage, current, frequency & phase by oscilloscope. Frequency limitation of CRO. Sampling and storage oscilloscope, Double beam CRO.

Electronic Instruments:
Advantages of digital meter over analog meters, Digital voltmeter, Resolution and sensitivity of digital meters, Digital multimeter, Digital frequency meter, Signal generator.

Sensors &Transducers:
Introduction to sensors &Transducers, Strain gauge, LVDT, Temperature transducers, Flow measurement using magnetic flow measurement.

Text Books

1. A.K.Sawhney, A course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and sons

References

1. H.S.Kalsi, Electronic Instrumentation, Tata McGraw hill

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Data structure & algorithmLab
Course Code: CS(EE)491
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:

1. Develop problem solving ability using Programming.
2. Develop ability to design and analyze algorithms.
3. Introduce students to data abstraction and fundamental data structures.
4. Develop ability to design and evaluate Abstract Data Types and data structures.
5. Apply data structure concepts to various examples and real life applications

Learning Outcomes:

The course will use hands on practice and applying the knowledge gained in theory course to different day to day real world applications..Upon the completion of data structure and algorithm practical course, the student will be able to:

- **Understand** and implement different type of data structure techniques
- **Analyze** the hashing method..
- **Implement** different type os sorting searching techniques.

Course Contents:

Exercises that must be done in this course are listed below:

Exercise No.1: Implementation of array operations
Exercise No. 2: Stacks and Queues: adding, deleting elements
Exercise No. 3: Circular Queue: Adding & deleting elements
Exercise No. 4: Merging Problem :Evaluation of expressions operations on Multiple stacks & queues
Exercise No. 5: Implementation of linked lists: inserting, deleting, inverting a linked list.
Exercise No. 6: Implementation of stacks & queues using linked lists, Polynomial addition, Polynomial multiplication
Exercise No. 7: Sparse Matrices : Multiplication, addition.
Exercise No. 8: Recursive and Non-recursive traversal of Trees
Exercise No. 9: Threaded binary tree traversal. AVL tree implementation
Exercise No. 10: Application of Trees. Application of sorting and searching algorithms

Text Book:

1. YashavantKanetkar, Abduln A.P.J. Kalam," Data Structure Through C",2nd edition, BPB Publications
2. Seymour Lipschutz,"Data Structures",Revised First edition,McGraw Hill Education.

Recommended Systems/Software Requirements:

1. Intel based desktop PC with minimum of 166 MHZ or faster processor with at least 64 MB RAM and 100 MB free disk space.
2. Turbo C or TC3 complier in Windows XP or Linux Operating System.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Thermal Power Engineering Lab
Course Code: ME(EE) 481
L-T –P Scheme: 3P **Course Credits: 2**

Course Description & Objectives:

In this laboratory, students will have the opportunity to study the working principle of IC engines (both SI and CI engines), performance and characteristics in terms of heat balancing, economical speed variations, air fuel ratio influence on the engine to reinforce classroom theory by having the student perform required tests, analyze subsequent data, and present the results in a professionally prepared report.
The machines and equipment used to determine experimental data include cut models of 4stroke diesel engine, 2stroke petrol engine, 4stroke and two stroke petrol engines with required specifications, Multi cylinder SI engine, Single cylinder Diesel engine for performance and speed test which is suitable to tests on variable compression ratios.

Course Outcomes:

1. **Determine** the valve timing diagram of SI engine & CI engine.

2. **Analyze** the influence of variations in TDC and BDC operations

3. **Calculate** the IP,BP, brake thermal efficiency.

4. **Calculate & Compare** the performance characteristics.

5. **Experiment** on IC engine load variations with Air fuel ratio.

6. **Apply** the concept of Morse test on SI engine.(multi cylinder).

7. **Analyse** the efficiency of reciprocating air compressor

8. **Determine** the principle of various parameters in boilers.

Course Contents:

1. StudyofCutModels–BoilersIC Engines

   !LanchashireBoiler

   !Bahcock&WillcoxBoiler

   !CochranBoiler

   !VerticalTubularBoiler

   !LocomotiveBoiler

!4SDieselEngine

!4S PetrolEngine

!2S PetrolEngine

2. LoadTeston4StrokePetrolEngine&DieselEngineby ElectricalLoadBox.
3. LoadTeston4StrokeDieselEnginebyRopeBrakeDynamometer.
4. HeatBalanceon4StrokeDieselEnginebyRopeBrakeDynamometer&byElectricalLoadBox.
5. ValveTimingDiagramon 4S DieselEngineModel&4S PetrolEngineModel.
6. TofindtheCalorificValueofDieselFuel&CoalbyBombCalorimeter.
7. TofindtheFlashPoint&FirePointof Petrol&DieselFuel.
8. TofindtheCloudPoint&PourPointofPetrol&DieselFuel.
9. TofindCarbonParticlePercentageinDieselEngineExhaustSmokebySmokemeterandtracethe BHPVs.%CarbonCurve.
10. Measurementof theQualityofSteam–Enthalpy&Drynessfraction.

Course Description

11. Tofindoutthe Boilerperformance–
Boilerefficiency&Steamevaporationrate.

12. TovisitaThermalPowerStation&studyofthefollowings:

a)Boiler b)Steampipe c)Furnace
d)Economizere)Preheaterf)Steamturbines
g)Alternator h)Watertreatmentplant i)E.S.P.

TEXT BOOK:

1. Nag. P.K., "Power Plant Engineering", Third Edition, Tata McGraw – Hill Publishing Company Ltd., 2008.
2. . P.K.Nag-EngineeringThermodynamics–TMH

REFERENCES:

1. El-Wakil. M.M., "Power Plant Technology", Tata McGraw – Hill Publishing Company Ltd., 2010.
2. Black & Veatch, Springer, "Power Plant Engineering", 1996.
3. Thomas C. Elliott, Kao Chen and Robert C. Swanekamp, "Power Plant Engineering", Second Edition, Standard Handbook of McGraw – Hill, 1998.
4. Godfrey Boyle, "Renewable energy", Open University, Oxford University Press in association with the Open University, 2004.

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Electric Machine-I Lab
Course Code: EE491
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:

1. Observe the Hopkinson's test and found that the efficiency for the both the generator and motor are same.
2. Observe the speed variation of the DC motor by the resistance of the armature and field
3. Perform the blocked rotor and No load test of a three phase induction motor and find out result to compare that with the theoretical one.

Learning Outcomes: By doing this practical students will gain the knowledge about the different parts of the DC machine and Three Phase Induction Motor. Upon the completion of this practical course, the student will be able to:

- Understand the efficiency of the same rated machine will be same for a dc generator and dc motor
- Understand the speed variation of the motor by varying the different resistance of the motor.
- Get a Knowledge about the result of the three phase induction Motor and find out that this results are helpful to find out the equivalent parameter of the motor.

Course Contents:

Exercises that must be done in this course are listed below:

Experiment No.1: Perform the Hopkinson's Test of Two same rated DC Machines
Experiment No. 2: Speed Control of DC Motor using armature resistance control
Experiment No. 3: Speed Control of DC Motor using filed resistance control
Experiment No. 4: Perform the No load test of three phase Induction Motor
Experiment No. 5: Perform the Blocked Rotor test of Three Phase Induction Motor

Text Books:

1. Electrical Machine by Ashfaq Hussain

References:

1. A Text book of Electrical Technology (Volume-2) by B.L.Theraja, A.K. Theraja
2. Electrical Machinery by Dr.P.S. Bimbhra
3. Theory and Performance of Electrical Machine by J.B.Gupta

EXPERIMENT NO: 01

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR
Lab Manual

AIM: To Verify the Maximum Power Transfer Theorem in breadboard

APPARATUS REQUIRED:-

(i) Bread Board
(ii) Connecting Wire
(iii) Different values of resistances
(iv) A Dc power Source

THEORY:

This theorem is applicable for analyzing communication networks. According to this theorem"A resistive load will draw the maximum power from a network when the load resistance is equal to the resistance of the network as viewed from its output terminals, with all energy sources removed leaving behind their internal resistances." If R_L is the load resistance connected across terminals a and b which consist of variable DC supply and internal resistance is R_S, then according to this theorem, the load resistance will draw maximum power when it is equal to R_S i.e. $R_L = R_S$.

And the maximum power drawn= $\mathbf{V^2_{oc}/4\ R_L}$

Where, Voc is the open circuit voltage at the terminals from which R_L is disconnected.

The variable resistor taken should be larger than fixed resistor. Then only power can be calculated.

CIRCUIT DIAGRAM:

Draw the circuit diagram as per the resistance and circuit are given in the lab.

CALCULATIONS:

Calculate the theoretical data's of the given circuit

OBSERVATION TABLE:

Course Description

S.No	Load Resistance(R_L)	I_L(Load Current)	Power($P=I_L^2*R_L$)

RESULT:

Plot a graph between load resistance and power and observe that the power will be maximum when (Load resistance= Internal Resistance)

DISCUSSION:

EXPERIMENT NO: 02

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Lab Manual

AIM: To Perform open circuit test on single phase transformer

APPARATUS REQUIRED:-

(i) MultiMeter
(ii) Connecting Wire
(iii) Open circuit test panel
(iv) A single phase Transformer
(v) A LPF Wattmeter

THEORY:

The purpose of the **Open Ckt. Test** is to determine no load loss or core loss and no load I_0 which is helpful in finding X_0 and R_0. One winding of the transformer usually high voltage winding is left open and the other is connected to its supply of normal voltage and frequency. A wattmeter (W), Voltmeter (V) and ammeter (A) are connected in the low voltage winding, i.e., primary winding in the present case. With normal voltage applied to the primary, normal flux will be setup in the core, hence normal iron losses will occur which are recorded by the wattmeter. As in the primary no load current I_0 is small, Cu loss is negligibly small in primary and nil in secondary. Hence, the wattmeter reading represents practically the core loss under no load condition.

CIRCUIT DIAGRAM:

OBSERVATION TABLE:

$V_{1=}$ Supply Voltage

$I_{0=}$ No Load Current measure by the ammeter

W= Core loss measure by the LPF Wattmeter

V_1	I_0	W	cos Ø	X_0	R_0

CALCULATIONS:-

$W=V_1 I_0 \cos Ø$

Therefore, $X_0 = V_1/ I_u$, $R_0= V_1/ I_w$

Where $I_{w=} I_0 \cos Ø$, $I_{u=} I_0 \sin Ø$

RESULT:

The Iron loss is obtained to ……W

DISCUSSION:

EXPERIMENT NO: 03

TITLE: Perform Short circuit test on single phase transformer

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR

Lab Manual

AIM: To Perform Short circuit test on single phase transformer

APPARATUS REQUIRED:-

(i) MultiMeter
(ii) Connecting Wire
(iii) Open circuit test panel
(iv) A single phase Transformer
(v) A Wattmeter

THEORY:

For **short circuit test**, one winding usually the low voltage winding, is short- circuited by a thick conductor (or through an ammeter which may serve the additional purpose of indicating rated load current).

A low voltage (usually 5 to 10% of normal primary voltage) at correct frequency is applied to the primary and is gradually and cautiously increased till full- load current is flowing both in primary and secondary (as indicated by the respective ammeters).

Since, in this test, the applied voltage is a small percentage of the normal voltage, the mutual flux ø produced is also a small percentage of its normal value. Hence, core losses are very small with the result that the wattmeter reading represents the full load Cu loss or i^2 R loss for the whole transformer, i.e. sum of both primary and secondary Cu losses.. The equivalent impedance of the transformer under short- circuit condition, if Vsc is the voltage required to circulate rated load currents, is then given by Z_{01}= Vsc/I_1.

CIRCUIT DIAGRAM:

OBSERVATION TABLE:-

I= Short Circuit Current

W= Power measure by the Wattmeter

V	I	W	Z_{01}	X_{01}	R_{01}

CALCULATION

For Short Circuit Test:-

$W= I^2 R_{01}$

$R_{01} = W/I^2$

$Z_{01}= V/ I$

$X_{01}^2= (Z_{01}^2- R_{01}^2)$

RESULT:

The Cu loss is obtained to ……W

DISCUSSION:

EXPERIMENT NO: 04

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR
Lab Manual

AIM: To Control the speed of the DC Motor by varying the armature resistance

APPARATUS REQUIRED:-

(i) MultiMeter
(ii) Connecting Wire
(iii) Speed Control test panel
(iv) A DC Motor
(v) A Rheostat
(vi) A Tachometer

THEORY:

Any D.C. motor can be made to have smooth and effective control of speed over a wide range. The shunt motor runs at a speed defined by the expressions.

Eb= ZNPθ ΦI γ ||||||| and Eb =V – IaRa|
i.e.,

N=(V -I R_a)/ KΦ |Ε||| where K X|ZP/ 60A

|
|
Since IaRa drop is negligible N α V and N ℑ|KΦ or N ℑ|1Φ$_f$

Where N is the speed, V is applied voltage, Ia is the armature current, and Ra is the armature resistance and Φ is the field flux.

Armature resistance control:
Speed control is achieved by adding an external resistance in the armature circuit. This method is used where a fixed voltage is available. In this method, a high current rating rheostat is required.
Disadvantages:
(a) Large amount of power is lost as heat in the rheostat. Hence, the efficiency is low.
(b) Speed above the rated speed is not possible. The motor can be run from its rated speed to low speeds.

CIRCUIT DIAGRAM:

OBSERVATION TABLE:

SI.No.	Armature Voltage	Armature Resistance	Speed

RESULT:

Draw a graph between the armature voltage and speed of the motor and show that the speed decreases as the armature voltage increases.

DISCUSSION:

EXPERIMENT NO: 05

UNIVERSITY OF ENGINEERING AND MANAGEMENT, JAIPUR
Lab Manual

AIM: To Control the speed of the DC Motor by varying the armature resistance

APPARATUS REQUIRED:-

(i) MultiMeter
(ii) Connecting Wire
(iii) Speed Control test panel
(iv) A DC Motor
(v) A Rheostat
(vi) A Tachometer

THEORY:

Any D.C. motor can be made to have smooth and effective control of speed over a wide range. The shunt motor runs at a speed defined by the expressions.

Eb= ZNPθ ΦI γ ||||||| and Eb =V – IaRa|
i.e.,

N=(V -I R_a)/ Kθ |Ε||| where K X|ZP/ 60A

|
|
Since IaRa drop is negligible N α V and N ℑ|KΦθ or N ℑ|1Θ$_f$

Where N is the speed, V is applied voltage, Ia is the armature current, and Ra is the armature resistance and Φ is the field flux.

Field flux control:
Speed control by adjusting the air gap flux is achieved by means of adjusting the field current i.e., by adding an external resistance in the field circuit. The disadvantage of this method is that at low field flux, the armature current will be high for the same load. This method is used to run the motor above its rated speed only.

CIRCUIT DIAGRAM:

OBSERVATION TABLE:

Sl No	Field Resistance	Field current	Speed

RESULT:

Draw a graph between the Field current and speed of the motor and show that the speed increases as the field current increases.

DISCUSSION:

UNIVERSITY OF ENGINEERING & MANAGEMENT, JAIPUR

Course Description

Title of Course: Electrical & Electronic Measurement Lab
Course Code: EE 492
L-T-P scheme: 0-0-3 **Course Credit: 2**

Objectives:

1. To introduce the student fundamentals of Electronics Instruments and Measurement
2. To understand how measuring instruments work for measurement of electrical and non electrical quantity.
3. Providing practical ideas and an in-depth understanding of Measurement procedures.

Learning Outcomes: The students will have a detailed knowledge of the concepts of different measuring methods and the devices that has to be used for the purpose. Upon the completion of Operating Systems practical course, the student will be able to:

- **Understand** necessity of measuring devices and also proper selection of the devices
- **Use** proper instruments for measuring electrical and non electrical quantities**.**
- **Understand** effects of the internal impedances of meteres while measuring.
- **Analyze** General features of analog meteres
- **Learn** the application of ac and dc potentiometer to measure unknown emf
- **Understand** the fundamental concepts of CRO and it's use to measure electrical parameters

Course Contents:

Exercises that must be done in this course are listed below:

Exercise No. 1: Measure a resistance using Kelvin's Double Bridge
Exercise No. 2: Measure unknown capacitance using Schering Bridge
Exercise No. 3: Measure self inductance using Anderson's Bridge.
Exercise No. 4: Measure unknown value of capacitance using De Sauty Bridge
Exercise No. 5: Measure Unknown frequency using Wein's Bridge
Exercise No. 6: Measure three phase power and power factor
Exercise No. 7: Study the operation of CRO

Text Book:

1. A.K. Sawhney, A course in Electrical & Electronic Measurements & Instrumentation, Dhanpat Rai and sons

Recommended Systems/Apparatus Requirements:

1. Laboratory Kits, Multimeters, CRO, Connecting wires.