E.G.S. PILLAY ENGINEERING COLLEGE

(Autonomous)

Approved by AICTE, New Delhi | Affiliated to Anna University, Chennai

Accredited by NAAC with 'A' Grade | Accredited by NBA

NAGAPATTINAM – 611 002

B.E. ELECTRICAL AND ELECTRONICSENGINEERING

Full Time Curriculum and Syllabus

Third Year – Fifth Semester

Course Code	Course Name	L	T	P	C	Maximum Marks		
						CA	ES	Total
Theory Course								
1702EE501	Electrical Machine Design	3	2	0	4	40	60	100
1702EE502	Linear Control Systems	3	2	0	4	40	60	100
1702EE503	Power Electronics	3	0	0	3	40	60	100
1703EE001	Elective-I	3	0	0	3	40	60	100
1703EE002	Elective-II	3	0	0	3	40	60	100
1702CS504	Object Oriented Programming	3	0	0	3	40	60	100
Laboratory Course								
1702CS554	Object Oriented Programming Laboratory	0	0	2	1	50	50	100
1702EE551	Measurement and Control Laboratory	0	0	2	1	50	50	100
1704EE552	Mini Project - I	0	0	2	1	100	0	100
1704GE551	Life Skills: Aptitude-I	0	0	2	1	100	0	100

L – Lecture | T – Tutorial | P – Practical | CA – Continuous Assessment | ES – End Semester

1702EE501 **ELECTRICAL MACHINE DESIGN** **L T P C**
3 2 0 4

PREREQUISITE :

1. Electrical Machinery-I
2. Electrical Machinery-II

COURSE OBJECTIVES:

1. To study MMF calculation and thermal rating of various types of electrical machines.
2. To understand the design methods of armature and field systems for D.C. machines.
3. To analyze the design details of core, yoke, windings and cooling systems of transformers.
4. To analyze design of stator and rotor of induction and synchronous machines

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1 Explain the major considerations in electrical machine design by considering thermal, magnetic and electric loadings (K2)
CO2 Calculate the design parameters of a DC machine(K3)
CO3 Compute the design parameters of a transformer (K3)
CO4 Calculate the design parameters of Induction motor (K3)
CO5 Calculate the design parameters of synchronous machine (K3)

UNIT I INTRODUCTION TO MACHINE DESIGN **12 Hours**

Major considerations in electrical machine design, electrical engineering materials; space factor, choice of Specific electrical and magnetic loadings, thermal considerations, rating of machines; standard specifications.

UNIT II DC MACHINES **12 Hours**

Design of DC machines: general considerations, output equation, main dimensions, choice of specific electric and magnetic loading, magnetic circuits calculations; Carter"s coefficient, net length of iron, real & apparent Flux densities; selection of number of poles - design of armature - design of commutator and brushes.

UNIT III TRANSFORMERS **12 Hours**

Design of transformers: general considerations, output equation, KVA output for single phase and three phase transformers, window space factor; design of core and winding, overall dimensions, operating characteristics, no load current; temperature rise in transformers - design of tank- methods of cooling of transformers.

UNIT IV INDUCTION MOTORS **12 Hours**

Design of induction motors: general considerations, output equation, choice of average flux density, main dimensions, length of air gap; rules for selecting rotor slots of squirrel cage machines, design of rotor bars & slots, design of end rings, design of wound rotor ; magnetic leakage calculations, leakage reactance of poly Phase machines, magnetizing current, short circuit current.

UNIT V SYNCHRONOUS MACHINES **12 Hours**

Design of synchronous machines: general considerations, output equation, choice of electrical and magnetic loading, main dimensions, short circuit ratio, stator design, stator parameters, estimation of air gap length, design of rotor, design of damper winding, determination of full load field mmf, design of field winding, Design of turbo alternators, rotor design.

TOTAL **60 Hours**

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Case study/seminar on simulated design of machines using MAGNET software
2. Design of turbo generator

REFERENCES:

1. Sawhney, A.K., 'A Course in Electrical Machine Design', Dhanpat Rai & Sons, New Delhi, 2013
2. M.V. Deshpande, “Design and Testing of Electrical Machine Design” Wheeler Publications, 2010.
3. A. E. Clayton, NN Hancock “The Performance and Design of Direct Current Machines” CBS Publisher, First Edition, 2004.
4. R.K. Agarwal, “Principles of Electrical Machine Design”, Esskay Publications, Delhi, 2002.
5. Sen, S.K., 'Principles of Electrical Machine Designs with Computer Programmes', Oxford and IBH Publishing Co. Pvt. Ltd., New Delhi, 1987.
6. http://nptel.ac.in/108106023/

1702EE502 **LINEAR CONTROL SYSTEMS** **L T P C**

3 2 0 4

PREREQUISITE :

1. Electric circuit analysis
2. Engineering Mathematics

Course Objectives:

1. To understand the basic components of control systems
2. To gain the knowledge in time and frequency domain tools for the design and analysis of Feedback control systems.
3. To understand the design of compensator and concepts of state variable analysis.

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1 Calculate transfer function of various systems using block diagram reduction, signal flow graph technique(K3)

CO2 Investigate the time response behavior of first and second order system using time domain specification (K3)

CO3 Analyze the frequency response of open loop transfer function using bode plot and polar plot(K3)

CO4 Examine the Stability and compensator design in control systems using various . Plots(K3).

CO5 Organize the concept of State Variable models and its applications (K3)

Unit I SYSTEMS ANDTHEIR REPRESENTATION 12 Hours

Basic elements in control systems; open and closed loop systems; Electrical analogy of mechanical system; Transfer function, Block diagram reduction techniques, Signal flow graph.

Unit II TIME RESPONSE 12 Hours

Time response - time domain specifications; types of test input, first and second order system response; error Coefficients, steady state error; effects of P, PI, PID modes of feedback control.

Unit III FREQUENCY RESPONSE 12 Hours

Frequency response - Bode plot, Polar plot; determination of closed loop response from open loop response; Correlation between frequency domain and time domain specifications.

Unit IV STABILITY AND COMPENSATOR DESIGN 12 Hours

Characteristics equation; Routh Hurwitz criterion, Root locus construction, Nyquist stability criterion; lag, lead and lag-lead networks; lag/lead compensator design using bode plots.

Unit V STATE VARIABLE ANALYSIS 12 Hours

Concept of state variables, state models for linear and time invariant systems; solution of state and output equation in controllable canonical form, concepts of controllability andobservability.

Total: 60 Hours

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Lead, Lag compensator of frequency response.
2. AC and DC servomotor for control system applications.

REFERENCES:

1. M. Gopal, "Control Systems, Principles and Design", 4th Edition, Tata McGraw Hill, New Delhi,2012
2. S.K. Bhattacharya, "Control System Engineering" 3rd Edition, Pearson, 2013.
3. Dhanesh. N. Manik, "Control System" Cen gageLearning,2012
4. Richard C. Dorf and Robert H. Bishop, "Modern Control Systems", Pearson Prentice Hall, 2012.
5. K. Ogata, „Modern Control Engineering", 5th edition, PHI, 2012.
6. Nagrath I.J and Gopal M, "Control Systems Engineering", New Age Publishers, 5tn Edition, 2009.
7. https://onlinecourses.nptel.ac.in/noc18_ee20/preview

1702EE503	POWER ELECTRONICS	L	T	P	C
		3	0	0	3

PREREQUISITE :

1. Electron Devices and Circuits
2. Linear Integrated Circuits

COURSE OBJECTIVES:

1. To study the important aspects of power semiconductor devices
2. To understand the concepts of power conversion and control using power electronic devices
3. To analyze the performance of power modulators

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1 Understand the structure and characteristics of power semiconductor devices (K2)

CO2 Elucidate the operation of power modulators(K2)

CO3 Analyze the control techniques used in power modulators(K3)

CO4 Analyze the performance parameters of power converters(K3)

CO5 Explain the operation and characteristics of various power electronics converters (K3).

UNIT I POWER SEMICONDUCTOR DEVICES 9 Hours

Power semiconductor devices – Power Diodes, Power Transistors, Power MOSFETs ,IGBTs , TRIACs, GTOs, IGCT, Working , Static and Dynamic characteristics;

SCR – Two-transistor analogy, Turn on and Turn off characteristics, Snubber circuits, Series and parallel operation of SCRs, Driver circuits.

UNIT II PHASE- CONTROLLED CONVERTERS 12 Hours

Principle of phase control – single phase and three phase half wave and full wave converter with R,RL,RLE load, Continuous and Discontinuous conduction, Estimation of average & RMS values of load voltage, load current ; Performance parameters for converters – Effect of freewheeling diodes , Effect of source inductance, Dual Converter.

UNIT III DC TO DC CONVERTER 8 Hours

DC Choppers – Principle of step up and step down chopper operation , Control strategies , Classification & Operation of choppers, Single quadrant, Two quadrant and four quadrant DC choppers – Buck, Boost and Buck boost converters; Introduction to Multilevel Inverter – single phase cascaded H-Bridge MLI.

UNIT IV INVERTERS 8 Hours

Types of inverters – operation of single phase VSI, Three phase VSI (120 , 180) degree modes – Inverter output voltage control, Pulse Width Modulation Techniques, single, multiple, sinusoidal modulation-Harmonic Elimination Techniques.

UNIT V AC TO AC CONVERTERS 8 Hours

AC Voltage Controllers (Single phase and three phase) – half wave with R, RL loads, Expression for Load voltage and current, sequence control of AC regulators ;

Cyclo converters – Single phase to single phase, three phase to single-phase cyclo converter, Control strategies; Introduction to Matrix converter.

Total: 45 Hours

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR:

1. Space vector pulse width modulation
2. Advanced resonant converters

REFERENCES:

1. Rashid M H, “Power Electronics-Circuits, Devices and Applications”, Prentice Hall of India, New Delhi, 2011.

2. P.S.Bimbhra, “Power Electronics”, Khanna Publishers, New Delhi, 2006.

3. Vedam Subramanyam, “Power Electronics”, New Age International, New Delhi, 1996.

4. V.Jagannathan, “Power electronic devices and circuits”, PHI Publications.

5. Ned Mohan Tore.M.Undeland, and William.P.Robbins, “Power Electronics: Converters, applications and Design”, John Wiley and sons, third edition, 2003.

6. http://nptel.ac.in/courses/108108077/

1703EE001 **SPECIAL ELECTRICAL MACHINES** **L T P C**
3 0 0 3

PREREQUISITE:

1. Electrical Machinery – I &II
2. Power Electronics
3. Microprocessor and Microcontroller

COURSE OBJECTIVES:

1. To understand the construction and operation of Special electrical machines.
2. To analyze the performance parameters of special electrical machines.
3. To design a closed loop control circuit for special electrical machines

COURSE OUTCOMES:

On the successful completion of the course, students will be able to

CO1 Explain the constructional features and operation of special electrical machines.
CO2 Draw and explain the phasor diagram and characteristics of special electrical machines.
CO3 Determine the torque and voltage equations of special electrical machines.
CO4 Describe the operations of circuits associated with special electrical machines.
CO5 Explain the closed loop control of special electrical machines and able to list its applications.

UNIT I SYNCHRONOUS RELUCTANCE MOTOR 9 Hours

Constructional features, types – axial & radial flux motors, operating principles, variable reluctance motors – Voltage and torque equations, phasor diagram, performance characteristics, applications.

UNIT II STEPPER MOTORS 9 Hours

Constructional features, principal of operation, variable reluctance motor, hybrid motor, single and multi-stack configurations, torque equations, modes of excitation, characteristics, drive circuits, microprocessor control of Stepper motors, closed loop control, concept of lead angle, applications.

UNIT III SWITCHED RELUCTANCE MOTORS 9 Hours

Evolution of switched reluctance motors, constructional features, rotary and linear SRM, principle of operation, torque production, steady state performance prediction, analytical method, power converters and their controllers, Methods of rotor position sensing, sensor less operation, characteristics and closed loop control, applications.

UNIT IV PERMANENT MAGNET BRUSHLESS DC MOTORS 9 Hours

Permanent magnet materials, minor hysteresis loop and recoil line, magnetic characteristics, permeance coefficient, principle of operation, types, magnetic circuit analysis, EMF and torque equations, commutation, power converter Circuits and their controllers, motor characteristics and control, applications.

UNIT V PERMANENT MAGNET SYNCHRONUS MOTOR 9 Hours

Principle of operation, ideal PMSM, EMF and torque equations, armature MMF, synchronous reactance, sine wave motor with practical windings, phasor diagram, torque / speed characteristics, power controllers, converter volt – ampere requirements, applications.

TOTAL: 45 HOURS

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Design of BLPM Motors and SRM
2. DSP Based Motion Control

REFERENCES:

1. K. Venkataratnam, "Special Electrical Machines", 1st Edition, CRC Press, 2009.
2. E. G. Janardanan, "Special Electrical Machines", PHI PVT LTD, 2014.
3. R.Krishnan, „Switched Reluctance Motor Drives – Modeling, Simulation, Analysis, Design and Application", CRC Press, New York, 2001.
4. J.R.HendershotandT.J.E.Miller,"DesignofBrushlessPermanentMagnetMachines",MotorDesignBooks, 2010.
5. T.J.E.Miller, „Brushless Permanent Magnet and Reluctance Motor Drives", Clarendon Press, Oxford, 1989.
6. T.Kenjo, "Stepping Motors and Their Microprocessor Controls", Clarendon Press London, 1984.

1703EE002 ELECTRICAL SAFETY AND MANAGEMENT L T P C
3 0 0 3

PREREQUISITE :

1. Transmission & Distribution

COURSE OBJECTIVES:

1. To Understand the concepts of Indian rules and earthing.
2. To get knowledge in first aid and fire extinguishers operating procedures.
3. To understand the safety policy in management & organizations.

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1 Understand the Indian electricity rules and their significance.(K2)
CO2 Identify hazardous areas in Industrial sectors.(K2)
CO3 Describe the various steps in first aid and safety during electrical installation**.**(K2)
CO4 Investigate the various fire extinguishers and its mode of operation.(K3)
CO5 Make use of energy management and energy auditing procedures in industrial sectors. (K3).

UNIT I RULES &REGULATIONS 9 Hours

Power sector organization and their roles; significance of IE rules & IE acts; general safety requirements: span, Conductor configuration, spacing and clearing, sag, erection, hazards of electricity.

UNIT II INSTALLATION AND EARTHING OF EQUIPMENTS 9 Hours

Classification of electrical installation; earthing of equipment bodies; electrical layout of switching devices and SCprotection;safetyinuseofdomesticappliances;safetydocumentationandworkpermitsystem;flashhazard Calculations; tools and test equipment's.

UNIT III SAFETY MANAGEMENT AND FIRST AID 9 Hours

Safety aspects during commissioning-safety clearance notice before energizing, safety during maintenance, maintenance schedule; special tools; security grand; check list for plant security; effects of electric and electromagnetic fields in HV lines and substations; safety policy in management & organizations; first aid; basic Principles; action taken after electrical shock; artificial respiration and methods.

UNIT IV FIRE EXTINGUISHERS 9 Hours

Fundamentals of fire- initiation of fires, types; extinguishing techniques, prevention of fire, types of fire extinguishers, fire detection and alarm system; CO2 and Halogen gas schemes; foam schemes.

UNIT V ENERGY MANAGEMENT &ENERGY AUDITING 9 Hours

Objectives of energy management; energy efficient electrical systems; energy conservation and energy policy; Renewable source of energy; energy auditing; types and tips for improvement in industry.

Total: 45 Hours

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR :

1. Brief about role of Bureau of Energy Efficiency (BEE) in energy conservation.
2. Implementation of engineering ethics in safety management.

REFERENCES:

1. Rao.S, Khanna.R.C, "Electrical safety, Fire safety engineering and safety management", Hanna publisher, Delhi, 2nd edition, 1998.
2. Cooper.W.F, "Electrical safety Engineering", Newnes-Butterworth company, 1978.
2. Power Engineering Hand book, TNEB Engineers officers, Chennai, 2002.
3. John Codick, "Electrical safety hand book", McGraw Hill Inc., New Delhi, 2000.
4. The Indian electricity rules, 1956, authority regulations, 1979, Commercial Law Publication, Delhi, 1999.
5. V. Manoilov, "Fundamentals of electrical safety", Mir Publishers, MOSCOW,1975

1702CS504 OBJECT ORIENTED PROGRAMMING

L	T	P	C
3	0	0	3

PREREQUISITE: 1. Programming in C
2. Introduction to Computer

Course Objectives:

1. To demonstrate adeptness of object oriented programming in developing solutions to problems demonstrating usage of data abstraction, encapsulation, and inheritance.
2. To understand the concepts behind object-oriented programming using C++
3. To analyze and understand the functionality of program code written in Java.

Course Outcomes:

After completion of the course, Student will be able to

CO1 Define the features of C++ supporting object oriented programming (K2)
CO2 Understand the major object-oriented concepts such that constructor and operator overloading in C++ (K2)
CO3 Identify to implement error handling techniques using exception handling (K3)
CO4 Identify classes, objects, methods of a class and relationships among them in Java (K3).
CO5 Understand the principles of Packages, Interfaces, Multithreading in Java (K2)

Unit I INTRODUCTION TO OOP'S AND C++ 9 Hours

Object oriented programming concepts – objects – classes – methods and messages –abstraction and encapsulation – inheritance – abstract classes –polymorphism. Introduction to C++ – classes – access specifiers – function and data members – default arguments – function overloading – friend functions – const. and volatile functions – static members – Objects – pointers and objects – constant objects – nested classes – local classes

Unit II CONSTRUCTORS 9 Hours

Constructors – default constructor – Parameterized constructors – Constructor with dynamic allocation – copy constructor – destructors – operator overloading – overloading through friend functions – overloading the assignment operator – type conversion – explicit constructor

Unit III EXCEPTION HANDLINGANDINHERITANCE 9 Hours

Function and class templates - Exception handling – try-catch-throw paradigm – exception specification – terminate and unexpected functions – Uncaught exception. Inheritance – public, private, and protected derivations – multiple inheritance – virtual base class – abstract class

Unit IV OVERVIEWOFJAVA 9 Hours

Data types, Variables and Arrays, Operators, Control Statements, Classes, Objects, Methods - Inheritance

Unit V EXCEPTION HANDLING IN JAVA 9Hours

Packages and Interfaces, Exception Handling, Multithreaded Programming, Strings, Input/output

Total: 45 Hours

FURTHER READING / CONTENT BEYOND SYLLABUS / SEMINAR:

RTTI, Runtime Polymorphism, ANSI String Objects,

References:

1. B. Trivedi, "Programming with ANSI C++", Oxford University Press, 2007.
2.H.M.Deitel, P.J.Deitel, "Java how to program", Fifth edition, Prentice Hall of India private limited, 2003
3. Ira Pohl, "Object-Oriented Programming Using C++", Pearson Education Asia, 2003.
4.K.R.Venugopal, RajkumarBuyya, T.Ravishankar, "Mastering C++", TMH, 2003.
5.Herbert Schildt, "The Java 2: Complete Reference", Fourth edition, TMH, 2002

1702CS554	OBJECT ORIENTED PROGRAMMING LABORATORY	L	T	P	C
		0	0	2	1

PREREQUISITE:

1. Basic Computer knowledge.
2. Programming in C Lab

Course Objectives:

Justify the philosophy of object-oriented programming and the concepts of encapsulation, abstraction, inheritance, and polymorphism.
To make the student learn an object oriented way of solving problems using java.
To make the students to write programs using multithreading concepts and handle exceptions.

Course Outcomes:

After completion of the course, Student will be able to

CO1 Develop program to illustrate basic concept of OOP features and C++ concept
CO2 Implement the program using unary and binary operator overloading in C++
CO3 Write program to implement concept of inheritance and polymorphism in C++
CO4 Understand and Apply Object oriented features and Java concepts
CO5 Develop and implement program using exception handling and templates in Java

List of Experiments:

1. Static Data Members
2. Multiple constructor in a class
3. Operator overloading for Unary and binary operator
4. Multiple Inheritance
5. Constructor in derived classes
6. Virtual Base class
7. Friend Function
8. Control Statements in Java
9. Multi-threaded programming in Java
10. Exception handling in Java

Total: 45 Hours

Additional Experiments:

1. Program to overload unary and binary operator as Nonmember function.
2. Write a Java program to develop simple application using OOP"s concept.

References:

1. https://lecturenotes.in/practicals/19363-lab-manuals-for-object-oriented-programming
2. http://studentsfocus.com/cs6461-object-oriented-programming-lab-manual
3. http://bietbvrm.ac.in/public/testimonia
4. http://www.srmuniv.ac.in/sites/default/files

1702EE551	MEASUREMENT AND CONTROL LABORATORY	L	T	P	C
		0	0	2	1

PREREQUISTE;

1.Measurement and Instrumentation
2.Linear Control system

COURSE OBJECTIVES:

1.Knowledge on analysis and design of control system
2.Knowledge on analysis and design of instrumentation
3.Provide analysis and design of controller and compensators

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO1 Investigate various characteristics of sensors and transducers
CO2 Make use of bridge networks in measurement circuits for measuring unknown values
CO3 Discuss the concept of controllers and compensators
CO4 Analyze the stability of LTI system using software tool
CO5 Perform the signal conditioning, position control system operation and power measurements.

LIST OF EXPERIMENTS:

1. Measurement of Inductance, Capacitance and Resistance using Bridge networks
2. To study the characteristics of Temperature/Pressure/Displacement sensors
3. Measurement of energy (single and three phase)
4. Perform Signal Conditioning by using ADC and DAC
5. Study the effect of P, PI, PID controllers using MATLAB.
6. Stability analysis (Bode, root locus, Nyquist) of linear time invariant system using MATLAB
7. Transfer function of Armature/Field controlled Dc motor
8. Design of Lag, Lead and Lag-Lead compensators using MATLAB
9. AC and DC position control systems
10. Synchro-transmitter and receiver

Total: 30 Hours

ADDITIONAL EXPERIMENTS / INNOVATIVE EXPERIMENTS :

1. Plot the pole-zero configurations in s-plane for the given transfer function using Simulink.
2. Plot unit step response of given transfer function and find peak overshoot, peak time using Simulink.

REFERENCES:

1. Dr.T.Suresh Padmanabhan and J.Menaka, “Measurement and Control Laboratory Manual”, 2018.
2. Electrical Measurement and control manual byS.K.Bhattacharya.

1704GE551	LIFE SKILLS: APTITUDE – I	L	T	P	C
		0	0	2	1

PREREQUISITE :

Technical English – I and II

COURSE OBJECTIVES:

1. To brush up problem solving skill and to improve intellectual skill of the students
2. TobeabletocriticallyevaluatevariousreallifesituationsbyresortingtoAnalysisOf key issues and factors
3. To be able to demonstrate various principles involved in solving mathematical problems And thereby reducing the time taken for performing job functions.
4. To enhance analytical ability of students
5. To augment logical and critical thinking of Student

COURSE OUTCOMES:

After completion of the course, Student will be able to

CO 1 - Understand about number system.
CO2 - Gather information about ratio and proportion, averages
CO3 - Discuss about percentages, profit and loss
CO4 –Describe about coding and decoding, direction sense
CO5 – Understand the number and letter series number

UNIT I INTRODUCTION TO NUMBER SYSTEM, BASIC SHORTCUTS OF ADDITION, MULTIPLICATION,DIVISION **6 Hours**

Classification of numbers – Types of Numbers - Divisibility rules - Finding the units digit - Finding remainders in divisions involving higher powers - LCM and HCF Models - Fractions and Digits – Square, Square roots – Cube, Cube roots – Shortcuts of addition, multiplication, Division.

UNIT II RATIO AND PROPORTION, AVERAGES **6 Hours**

Definition of Ratio - Properties of Ratios - Comparison of Ratios - Problems on Ratios - Compound Ratio - Problems on Proportion, Mean proportional and Continued Proportion Definition of Average - Rules of Average - Problems on Average - Problems on Weighted Average - Finding average using assumed mean Method.

UNIT III PERCENTAGES, PROFIT AND LOSS **6 Hours**

Introduction Percentage - Converting a percentage into decimals - Converting a Decimal into a percentage - Percentage equivalent of fractions - Problems on percentages - Problems on Profit and Loss percentage- Relation between Cost Price and Selling price - Discount and Marked Price - Two different articles sold at same Cost Price - Two different articles sold at same Selling Price - Gain% / Loss% on Selling Price.

UNIT IV CODING AND DECODING, DIRECTION SENSE **6 Hours**

Coding using same set of letters - Coding using different set of letters - Coding into a number - Problems on R-model - Solving problems by drawing the paths - Finding the net distance travelled - Finding the direction - Problems on clocks - Problems on shadows - Problems on direction sense using symbols and Notations.

UNIT V NUMBER AND LETTER SERIES NUMBER AND LETTER ANALOGIES, ODD MAN OUT **6 Hours**

Difference series - Product series - Squares series - Cubes series - Alternate series - Combination series - Miscellaneous series - Place values of letters - Definition of Analogy - Problems on number analogy - Problems on letter analogy - Problems on verbal analogy - Problems on number Odd man out - Problems on letter Odd man out - Problems on verbal Odd man out

Total: 30 Hours

REFERENCES:

1. ArunSharma,„HowtoPrepareforQuantitativeAptitudefortheCAT‟,7th edition,McGrawHills publication,2016.
2. Arun Sharma, „How to Prepare for Logical Reasoning for CAT‟, 4th edition, McGraw Hills publication,2017.
3. R S Agarwal, „A modern approach to Logical reasoning‟, revised edition, S. Chand publication, 2017.
4. RSAgarwal,QuantitativeAptitudeforCompetitiveExaminations‟revisededition,S.Chand publication, 2017.
5. Rajesh Verma, "Fast Track Objective Arithmetic", 3rd edition, Arihant publication,2018.
6. B.S. Sijwalii and InduSijwali, "A New Approach to REASONING Verbal & Non-Verbal", 2nd edition, Arihnat publication,2014.

1704EE552	MINI PROJECT I	L	T	P	C
		0	0	2	1

GUIDELINE FOR REVIEW AND EVALUATION

The students may be grouped into 2 to 4 and work under a project supervisor. The circuit / system to be designed may be decided in consultation with the supervisor and if possible with an industry. A project report to be submitted by the group, which will be reviewed and evaluated for internal assessment by a Committee constituted by the Head of the Department. At the end of the semester examination the project work is evaluated based on oral presentation and the project report by internal examiners constituted by the Head of the Department

Total: 30 Hours