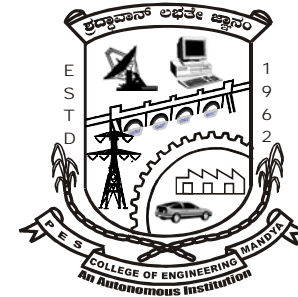


# Syllabus

## VI Semester B.E. Program Electrical & Electronics Engineering



**P.E.S. College of Engineering**  
Mandya - 571 401. Karnataka  
( An Autonomous Institution under VTU Belgaum)

Grant -in- Aid Institution  
(Government of Karnataka)  
Accredited by NBA, New Delhi  
Approved by AICTE, New Delhi.  
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**P.E.S. COLLEGE OF ENGINEERING, MANDYA**  
(An Autonomous Institution under VTU)  
**SCHEME OF TEACHING AND EXAMINATION**

**VI Semester B.E Electrical & Electronics Engineering**

| Sl No. | Course Code | Course Title                      | Teaching Dept. | Credit Pattern L : T : P | Total Credits | Total Hours/Week | Examination Marks |     |       | Exam Duration in hours |
|--------|-------------|-----------------------------------|----------------|--------------------------|---------------|------------------|-------------------|-----|-------|------------------------|
|        |             |                                   |                |                          |               |                  | CIE               | SEE | Total |                        |
| 1      | P08EE61     | Power System Analysis & Stability | E & EE         | 4:0:0                    | 4             | 4                | 50                | 50  | 100   | 3                      |
| 2      | P08EE62     | Switgear & Protection             | E & EE         | 4:0:0                    | 4             | 4                | 50                | 50  | 100   | 3                      |
| 3      | P08EE63     | Modern Control Theory             | E & EE         | 3:1:0                    | 4             | 5                | 50                | 50  | 100   | 3                      |
| 4      | P08EE64     | Electrical Machine Design         | E & EE         | 3:0:0                    | 4             | 5                | 50                | 50  | 100   | 3                      |
| 5      | P08EE65     | Microcontrollers                  | E & EE         | 3:0:0                    | 3             | 3                | 50                | 50  | 100   | 3                      |
| 6      | P08EE66     | Elective -A                       | E & EE         | 4:0:0                    | 4             | 4                | 50                | 50  | 100   | 3                      |
| 7      | P08EEL67    | Control Systems Lab               | E & EE         | 00:1.5                   | 1.5           | 3                |                   |     |       |                        |
| 8      | P08EEL68    | Microcontroller Lab               | E & EE         | 00:1.5                   | 1.5           | 3                | 50                | 50  | 100   | 3                      |
| 9      | P08EEL69    | Power Plant & Industrial Visit    | E & EE         | -----                    | -----         | ----             | 50                | 50  | 100   | 3                      |

\*MLC (Mandatory Learning Course)- Power plant & Industrial visit for 3 days during the Academic Semester. A brief report to be submitted by the student.

**Professional Elective -A**

**Professional Elective -A**

| SI No. | Course Code | Course Title                     |
|--------|-------------|----------------------------------|
| 1      | P08EE661    | Advanced Power Electronics       |
| 2      | P08EE662    | Programmable Logic Controllers   |
| 3      | P08EE663    | Digital System Design using VHDL |

| SI No. | Course Code | Course Title                     |
|--------|-------------|----------------------------------|
| 1      | P08EE664    | OOPS & C++                       |
| 2      | P08EE665    | Operations Research              |
| 3      | P08EE666    | Advanced Engineering Mathematics |

# POWER SYSTEM ANALYSIS AND STABILITY

**Course Code: P08EE61**  
**Credits : 4**

**Total Hours : 52**  
**Hours per Week: 4**

## **PART-A** **Unit-I**

### **Representation of Power System Components :**

Circuit models - transmission line, synchronous machines, transformer and load. Single line diagram, Impedance and Reactance diagrams. Per unit system - merits and demerits, Per unit impedance/reactance diagram of power system, illustrative Examples. 08 Hours

## **Unit-II**

### **Symmetrical Fault Analysis :**

Short circuit Transients on a transmission line, maximum momentary current, Short circuit current oscillogram, Short circuit currents and reactances of synchronous machines on no load, Internal voltages of loaded machine under transient condition, Selection of circuit breaker ratings, illustrative Examples. 06Hours

## **Unit-III**

### **Symmetrical Components :**

Symmetrical components analysis of unbalanced phasors, Power in terms of symmetrical components, Phase shift of symmetrical components in star-delta transformer bank, Analysis of balanced and unbalanced loads against unbalanced Three phase supply, Sequence impedances and sequence networks, Sequence impedance of power system elements (alternator, transformer and transmission line), Positive, Negative and Zero sequence networks of power system elements, illustrative Examples. 12 Hours

## **PART-B** **Unit -IV**

### **Unsymmetrical Faults :**

L-G, L-L, L-L-G faults on an unloaded alternator with and without fault impedance. Unsymmetrical faults on a power system with and without fault impedance, Open conductor faults in power system, illustrative Examples. 14 Hours

## **Unit-V**

### **Stability Studies :**

Steady state and transient stability, Steady state and transient stability limits, Rotor dynamics and Swing equation, Power angle equation, Equal area criterion for stability and its applications, illustrative Examples. 12 Hours

### **Text Books :**

- 1) "Elements of Power System Analysis", W.D.Stevenson, TMH, 4th Edition, 1984
- 2) "Modern Power System Analysis", I. J. Nagarath and D.P.Kothari, TMH, 4th Edition, 2007.

### **Reference Book :**

- 1) "Power system analysis", Hadi Sadat, TMH, 2nd edition, 12th reprint, 2007

# SWITCHGEAR AND PROTECTION

**Course Code: P08EE62**

**Credits : 4**

**Total Hours : 52**

**Hours per Week: 4**

## PART - A

### Unit-I

**Switches and Fuses** : Isolating switch, Load breaking switch, Fuse law, Cut-off characteristics, Time-current characteristics, Fuse material, HRC fuse, Liquid fuse, Application of fuse. 04 Hours

### Unit-II

**Principles of Circuit Breakers** : Principles of AC circuit breaking, Principles of DC circuit breaking, Problems encountered in DC breaking, Initiation & maintenance of arc, Arc interruption - high resistance and low resistance interruption, Arc interruption theories - Slepian's theory and energy balance theory, Re-striking voltage, Recovery voltage, Rate of rise of Re-striking voltage, Current chopping, Capacitance switching, Resistance switching, Rating of circuit breakers. 10 Hours

### Unit-III

**Circuit Breakers : Air Circuit breakers** - airbreak and airblast circuit breakers, **Oil circuit breakers** - single break, double break, minimum OCB; SF6 breaker - preparation of SF6 gas, puffer and non puffer type of SF6 breakers. **Vacuum circuit breakers** - Construction, Principle of operation, Advantages and disadvantages of different types of circuit breakers, Testing of circuit breakers - unit testing, synthetic testing ; Short circuit test lay out. 12 Hours

## PART - B

### Unit-IV

**Protective Relaying** : Requirement of protective relaying, Zones of protection, Primary and backup protection, Essential qualities of protective relaying, Classification of protective relays 04 Hours

### Unit-V

**Induction Type Relay** : Non-directional and directional over current relays, IDMT and Directional characteristics. Differential relay - principle of operation, percentage differential relay, bias characteristics, Distance relay - three stepped distance protection ; Impedance relay, Reactance relay, Mho relay, Buchholz relay, Negative Sequence relay, Microprocessor based over current relay - block diagram approach. 10 Hours

## Unit-VI

**Protection Schemes** : Generator Protection - Merz price protection, Prime mover faults, stator and rotor faults; Protection against abnormal conditions - unbalanced loading, loss of excitation, Over speeding; Transformer Protection - differential protection, differential relay with harmonic restraint, Inter turn faults; Induction motor protection - Protection against electrical faults such as phase fault and ground fault, Abnormal operating conditions such as single phasing, Phase reversal and over load. 12 Hours

### Text Books :

1. "Switchgear & Protection", Sunil S.Rao, 2006, Khanna Publishers, 10th edition,
2. "Fundamentals of Power System protection", Y G. Painthankar and S R Bhide, PHI publication, New Delhi, 2009.

### Reference Books :

1. "A Course in Electrical Power", Soni, Gupta & Bhatnagar, Dhanapathrai, Publication, 1997, reprint 2006.
2. "Power System Protection & Switchgear", Ravindarnath & Chandra, New age Publications, 1997, reprint 2008.
3. "Electrical Power", Dr S. L. Uppal, 13th edition, 1988, Khanna Publishers, 30th edition 1988, reprint 2001.
4. "Power System Protection & Switchgear" Badraram & Viswa Kharma, TMH, 1995, reprint 2008.

# MODERN CONTROL THEORY

Course Code: P08EE63  
Credits : 4

Total Hours : 52  
Hours per Week: 5

## PART - A

### Unit-I

**Modeling in state space** : Introduction, Limitations to classical control theory, Concept of State, State variables, State vector, State space, State-space equations, and block diagram of the linear, continuous -time control system represented in state space. State space model for physical systems-electrical, mechanical and electromechanical systems. 08 Hours

### Unit-II

State space representations of transfer function systems in canonical forms-Controllable, observable, diagonal, Jordan canonical forms, Eigen values, diagonalization, invariance of Eigen values. 08 Hours

### Unit-III

Solution of the linear time invariant state equation, computation using Laplace transformation, power series method, state transition matrix and its properties, Cayley-Hamilton method. 10 Hours

## PART - B

### Unit-IV

**Concept of Controllability & Observability**- Kalman's test and Gilbert's methods of determining the same, Complete controllability & observability in the s-plane. Stabilizability and Detectability, Principle of Duality. 08 Hours

### Unit-V

**Design of control systems in state space**; Design by Pole Placement, stability improvements by state feedback, necessary & sufficient conditions for arbitrary pole placement, state regulator design, and design of state observer. 08Hours

### Unit-VI

**Liapunov stability analysis** : Equilibrium state, Stability in the sense of Liapunov, Asymptotic stability, Asymptotic stability in the large, Instability and its graphical representation. Sign definiteness of scalar functions, Lyapunov's function, and Liapunov stability analysis of linear, Time invariant systems. Construction of Liapunov functions for nonlinear system by Krasovskii's method. 10 Hours

## Text Books :

1. "Modern Control Engineering", Katsuhiko Ogata- 3rd and 4th edition, PHI 2002 and 2005
2. "Control system Engineering", I. J. Nagarith & M. Gopal, - New Age International (P) Ltd,3rd edition,2000.

## Reference Books :

1. "Digital control & state variable methods", M. Gopal - 3rd edition, TM Hill, 2009

# ELECTRICAL MACHINE DESIGN

**Course Code: P08EE64**  
**Credits : 4**

**Total Hours : 52**  
**Hours per Week: 5**

## **PART-A** **Unit -I**

**Principles of Electrical Machine Design** : Introduction, Considerations for the design of electrical machines, Limitations. Different types of conducting, magnetic and insulating materials used in electrical machines. 04 Hours

### **Unit -II**

**Design of DC Machines** : Output equation, Choice of specific loadings and choice of number of poles, Design of Main dimensions of the DC machines, Design of armature slot dimensions, Commutators and brushes, Magnetic circuit- estimation of ampere turns, Design of yoke and poles - main & inter pole, Field windings-shunt, series. 10 Hours

### **Unit -III**

**DESIGN of TRANSFORMERS** : (Single phase and three phase): Output equation for single phase and three phase transformer, Choice of specific loadings, Expression for volts/turn, Determination of main dimensions of the core, Types of windings and estimation of number of turns and cross sectional area of primary and secondary coils, Estimation of no load current, Design of tank and cooling tubes (round and rectangular). 12 Hours

## **PART-B** **Unit-IV**

**DESIGN of INDUCTION MOTORS** : Output equation, Choice of specific loadings, Main dimensions of three phase induction motor, Stator winding design, Choice of length of the air gap, Estimation of number of slots for the squirrel cage rotor, Design of Rotor bars and end ring, Design of slip ring induction motor. 14 Hours

### **Unit-V**

**DESIGN of SYNCHRONOUS MACHINES** : Output equation, Choice of specific loadings, Short circuit ratio, design of main dimensions, Armature slots and windings, Slot details for the stator of salient and non salient pole synchronous machines. Design of rotor of salient pole synchronous machines, Magnetic circuits, Dimensions of the pole body, Design of the field winding, and Design of rotor of non-salient pole machine. 12 Hours

## **Text Books :**

1. "A Course In Electrical Machine Design", A.K.Sawhney, Dhanapath rai & co, Delhi, 4thedition, ,2006
2. "Design of Electrical Machines", V.N. Mittle -, standard publishers, New Delhi, 4th edition,2006

## **Reference Books :**

1. "Performance & Design of AC Machines", M.G Say, , CBS Publishers, 3rd edition,2002
2. "Performance & Design of DC Machines", A. E. Clayton & N. N. Hancock, CBS Publications, 3rd edition, 2004.
3. "Design data hand book", A. Shanmugasundaram, G. Gangadharan, R. Palani, Wiley Eastern publication.

# MICRO CONTROLLERS

**Course Code: P08EE65**  
**Credits : 3**

**Total Hours : 39**  
**Hours per Week: 3**

## **PART - A** **Unit-I**

**Microprocessors and Microcontroller. Introduction** - Microprocessors and Micro controllers, A Microprocessors survey. RISC & CISC CPU Architectures, Harvard & Von Neumann CPU architecture.

**8051 Architecture** : Introduction, 8051 Micro controller Hardware, Input / output pins, Ports and circuits, External memory, Counter and Timers, Serial data input / output , Interrupts. 07Hours

## **Unit-II**

**Addressing Modes and Operations** : Introduction, Addressing modes, External data moves, Code Memory , Read only data moves / indexed addressing mode , PUSH and POP opcodes, Data exchanges, Byte level logical operations, Bit level logical operations, Rotate and Swap operations, Arithmetic operations, Flags, Incrementing and decrementing, Addition, Subtraction, Multiplication and division, Decimal arithmetic, Programs. 12Hours

## **PART-B** **Unit-III**

**Jump and Call Instruction:** JUMP and CALL program range, Jumps, Calls and Subroutines, Interrupts and return, More detail on Interrupts, programs 05 Hours

## **Unit-IV**

**Timer / Counter programming in 8051:** Programming 8051 Timers, Counter Programming, Programming timers 0 and 1 in assembly language. 06 Hours

## **Unit-V**

**8051 Serial Communication** : Basics of serial Communication, 8051 connecting to RS-232, 8051 Serial communication programming, Programming the second serial port, Serial port programming in assembly language 05 Hours

## **Unit-VI**

**Interrupts Programming:** 8051 interrupts, Programming Timer Interrupts, Programming external Hardware Interrupts, Programming the Serial Communication Interrupts, Interrupt Priority in the 8051/52, interrupt programming in assembly language. 05Hours

## **Text Books :**

- 1."The 8051 Microcontroller Architecture, Programming & Applications", Kenneth J.Ayala, Thomason Learning ,2nd edition , 2005.
- 2."The 8051 Microcontroller and Embedded Systems- Using assembly and C", Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay, /Pearson Education,2nd edition , 2006.

## **Reference Books :**

1. "Programming and Customizing the 8051 Microcontroller", Predko -TMH,3rd edition, 2007
2. "Microcontrollers: Architecture, Programming, Interfacing and System design", Raj Kamal,Pearson Education, 4th edition, 2005
3. "Microcontrollers - Theory and Applications", Ajay V.Deshmukh, TMH , 3rd edition2005
4. "Microcontroller and its application", Dr. Ramani Kalpathki and Ganesh Raja, Sanguine Technical publishers, Bangalore-2005

# PROGRAMMABLE LOGIC CONTROLLERS

Course Code: P08EE662  
Credits : 4

Total Hours : 52  
Hours per Week: 4

## PART-A Unit-I

### INTRODUCTION :

Introduction to Programmable Logic Controller(PLC),roll in automation(SCADA),advantages and disadvantages,hardware,internal architecture, sourcing and sinking,characteristics of I/O devices, List of input and output devices,examples of applications,I/O processing,input/output units, signal conditioning, Remote connections,networks,processing inputs I/O addresses. 10Hours

## Unit-II

### PROGRAMMING:

Ladder programming-ladder diagrams,Logic functions, Latching,multiple outputs, Entering programs,functional blocks,program examples like location of stop and emergency switches 07 Hours

## Unit-III

### PROGRAMMING LANGUAGES :

Instruction list,sequential functions,charts and structured texts,Jumps and call subroutines 09Hours

## PART-B Unit-IV

### INTERNAL RELAYS :

Ladder Programs,Battery-backed relays,one-short operation,set and reset,master control relay. 12 Hours

## Unit-V

### TIMERS,CONTROLLERS :

Types of timers, programming timers, ON and OFF-delay timers,pulse timers,forms of counters,programming,up and down counting,timers and counters,sequencer. 06 Hours

## Unit-VI

### SHIFT REGISTERS:

Shift registers,ladder programs, registers and bits,data handling, arithmetic functions, temperature control and bottle packing applications. 08 Hours

## Text Books :

1."Programmable Logic Controllers"- W.Bolton, Elsevier-newness, 4th edition, 2006.

## Reference Books:

- 1."Programmable Controller Theory and applications"-L.A.Bryan,E.A.Bryan, An Industrial text company publication,- 2nd edition, 1997.
- 2."Programmable Controller -An Engineers guide "-E.A. Paar, newness, 3rd edition, 2003.

# DIGITAL SYSTEM DESIGN USING VHDL

Course Code: P08EE663  
Credits : 4

Total Hours : 52  
Hours per Week: 4

## PART-A

### Unit -I

**Introduction to VHDL** : Traditional design method, traditional schematic, Symbols Vs Entities, Schematic Vs, Architectures, Component instantiation, Behavioral descriptions, Event Scheduling, statement concurrency  
07 Hours

### Unit -II

**Behavior Modeling** : Introduction to behavior modeling, transport Vs inertial delay, inertial delay, transport model, delay models, drivers, generics, block statement  
06 Hours

### Unit -III

**Sequential Processing** : Process statement, Signal assignment Vs variable assignment, sequential statement like IF,CASE,LOOP, NEXT, EXIT, ASSERT and WAIT etc.  
08 Hours

### Unit -IV

**Data Types** : Object Types, Signal, Variables, Constants, Data Types, Scalar Types, Composite Types, Incomplete Types, File Types, File Type Caveats, Subtypes  
05 Hours

## PART-B

### Unit -V

**Sub-Programs and Packages** : Sub-programs, function, conversion functions, Resolution functions, Procedures packages, package declaration, deferred constant, sub-program declaration, package body.  
07 Hours

### Unit -VI

**Designing with Programmable Logic Devices** : Read - only Memories, Programmable logic arrays (PLAs), Programmable array logic (PALs), Other sequential programmable logic devices (PLDs), Design of a Keypad scanner.  
06 Hours

## Unit -VII

**Design of Networks for Arithmetic Operations** : Design of a serial adder with accumulator, State graphs for control networks, Design of a binary Multiplier, Multiplication of signed binary numbers, Design of a binary divider.  
06 Hours.

## Unit -VIII

**Digital Design with SM charts** : State machine charts, Derivation of SM charts, Realization of SM charts, Implementation of the Dice game, Alternative realization for SM charts using microprogramming, Linked state machines.  
07 Hours

### Text Books :

1. VHDL - Douglas Perry - Tata McGraw - Hill, New Delhi, 3rd Edn.,2006.
2. Charles H. Roth, Jr: Digital Systems Design using VHDL, Thomson Learning, Inc,2nd edition,2002

### Reference Books :

1. "Fundamentals of Digital Logic with VHDL design", Stephen Brown and Zvonko Vranesic : Tata McGraw - Hill, New Delhi ,3rd edition, 2003
2. "VHDL Primer", J Bhaskar Pearson / PHI, New Delhi, 3rd edition, 2003

# OBJECTED ORIENTED PROGRAMMING USING C++

Course Code: P08EE664  
Credits : 4

Total Hours : 52  
Hours per Week: 4

## PART-A

### Unit-I

**Principles of Object-Oriented Programming (OOP)** : Review of procedure oriented programming, Basic concepts of object oriented programming - object, class, encapsulation, inheritance, polymorphism; Benefits of OOPs, Applications of OOP. 04 Hours

### Unit-II

**The Basic Language C++** : Comparison of C and C++, Structure of C++ program with class, Preprocessor directives, C++ Statements - input/output, comments, tokens, keywords, identifiers, constants, Data types - string, pointer, reference, boole, enumeration, array, complex number, typed names, type compatibility, type conversion, qualifier - const, volatile; Operators in C++, Operator Precedence and Operator Overloading; C++ expressions - New and Delete. 06 Hours

### Unit-III

**Functions in C++** : Introduction, main() function, Function prototype, Call by reference, Return by reference, Inline functions, Default arguments, Const Arguments, Function overloading, Friend and virtual functions, Pointer to functions. 08 Hours

### Unit-IV

**Classes and Objects** : Introduction - declaration and definition of a class, Defining member functions, C++ program with a class, Making an outside function inline, Nesting of member functions, Arrays within a class, Static data members, Static member functions, Objects - global & local objects, scope & lifetime, Memory allocation for objects, dynamically allocated objects, pointers to objects, Arrays of objects, Function arguments with objects, Returning objects; const member functions. 08 Hours

## PART-B

### Unit-V

**Constructors and Destructors** : Introduction, Constructors, Parameterized Constructors, Multiple constructors in a class, Constructors with default arguments, Dynamic initialization of objects, Copy constructor, Constructing two-dimensional arrays, const Objects, Destructors. 04 Hours

### Unit-VI

**Operator Overloading and Type Conversion** : Introduction, Defining operator overloading, Overloading unary operators, Overloading binary operators, Overloading binary operators using friends, rules for overloading operators, overloading the output operator << , overloading the input operator >> , type conversion. 07 Hours

### Unit-VII

**Inheritance** : Introduction, Defining derived classes, Single inheritance, Making a private member Inheritable, Multilevel inheritance, Multiple inheritance and Hierarchical inheritance, Hybrid inheritance, Virtual base classes, Abstract classes, Constructors & Destructors in base & derived classes. 06 Hours

### Unit-VIII

**Pointer, Virtual Functions and Polymorphism** : Introduction, Pointers, Pointers to objects, this pointer, Pointers to derived classes, type-checking pointers, pointers to members, Virtual functions, Pure virtual functions. 05 Hours

### Unit-IX

**Managing Console I/O and File I/O** : C++ streams, C++ stream classes, examples of formatted and unformatted I/O operations, Classes for file stream operations, Opening and Closing a File, Opening file using open(), file modes (simple programming exercises). 04 Hours

### Text Book :

1. "Object Oriented Programming with C++", Balagurusamy, TMH, 3rd edition, 2007.

### Reference Books :

1. "C++, The Complete Reference", Herbert Schildt, TMH, 3rd edition, 2007
2. "The C++ programming language", Bjarne Stroustrup, Pearson Education, 3rd Edition, 2007.

# OPERATIONS RESEARCH

**Course Code: P08EE665**

**Credits : 4**

**Total Hours : 52**

**Hours per Week: 4**

## **PART - A**

### **Unit-I**

**Introduction :** Definition, Models, Different types, Characteristics, Phases, Applications, Advantages. 04 Hrs

### **Unit-II**

**Linear programming :** Introduction essentials of linear programming model, Properties of linear programming model, Formulation of linear programming, General linear programming model, Maximization and minimization models, Graphical model, Solving linear Programming problems graphically, Unbounded linear programming problems, Infeasibility, Degeneracy, Multiple solutions, Duality in linear programming problems (only theory). 12 Hours

### **Unit-III**

**Transportation model :** Introduction, Mathematical formulation, Network representation of transportation model, General representation of transportation model, Balanced transportation problems, unbalanced transportation problems, Procedure to solve transportation problems. 10 Hours

## **PART - B**

### **Unit-IV**

**Assignment model :** Introduction. Mathematical structure of assignment problem, Network representation of assignment problem, Types of assignment problem, HUNGARIAN method for solving assignment problem, unbalanced assignment problem, Restricted assignment problem, multiple and unique solutions. 10 Hours

### **Unit-V**

**Network analysis P.E.R.T. - C.P.M :** Introduction, PERT/CPM network components, Rules is constructing a network, Scheduling activities : Earliest time and latest time, Determination of float and slack times, PERT : Project evaluation review technique, Cost analysis. 10 Hours

### **Unit-VI**

**Game Theory :** Introduction, Terminology, two-person-zero-sum-game, Methods of solving mixed strategy problems. Dominance property, Problems 06 Hours

EE-17

## **Text Books :**

1. "Quantitative Techniques for Management", S.Jaisankar , PSG - Excel Series, Naraine , Phase-I New Delhi, 4th edition, 2006.
2. "Optimization Techniques", S.S.Rao , T.M.H New Delhi, 4th Edition, 2004.

## **Reference Books**

1. "Operation Research an introduction", Hamdy A Taha, Pearson Education, 8th Edition ,2007,
2. "Operation Research - Concept and Cases" , Fredric.S.Hiller and Lieverman , TMH 8th Edition, 2007

EE-18

# ADVANCED ENGINEERING MATHEMATICS

Course Code: P08EE666  
Credits : 4

Total Hours : 52  
Hours per Week: 4

## PART-A Unit -I

**Computational Methods** : Approximation and errors in Computations. Roots of algebraic and transcendental equations - Fixed point iteration method. Aitkin's -process. Newton-Raphson method-Quadratic Convergence. Generalized Newton's method for a system of non - linear equations. 07 Hours

## Unit -II

**Linear Algebra** : Vector spaces, subspaces, linear dependence and independence of vectors. Basis and dimensions. Linear transformations. Rank and nullity of linear transformations. 06 Hours

## Unit -III

**Matrix of linear transformations**, Illustrative examples. Eigen values and eigen vectors-Properties. Cayley-Hamilton Theorem(Statement only) - Matrix inversion. Basis of eigen vectors - Diagonalization. 07 Hours

## Unit -IV

**Methods for system of linear algebraic equations** : LU - Decomposition method. Gauss-Jacobi and Gauss-Seidel iterative methods. Computation of eigen values and eigen vectors of symmetric matrices-Jacobi method. 06 Hours

## PART-B Unit -V

**Difference equations**- Definition, Order and formation of difference equation. Linear difference equation of second and higher orders and their solutions- complementary function and particular integrals. Illustrative examples. 05 Hours

## Unit -VI

**Optimization** : Basic Concepts, Classification of Optimization problems. Mathematical formulation of linear programming problems. Graphical and Simplex methods. Degeneracy and difficulties in starting. 08 Hours

## Unit -VII

**Statistical inference** : Introduction to sampling distribution- Population, sample and sampling. Standard error and precision. Sampling distribution of

the means-simple examples. Testing of hypothesis-Null and Alternate hypothesis. Errors-Type I and type II errors. Significance level. 08 Hours

## Unit -VIII

**Tests of significance and confidence intervals**- one tailed and two tailed tests. Tests of significance for large and small samples- Chi- square and student "t" distribution. 05 Hours

## Text Books :

1. B.S. Grewal: "Higher Engineering Mathematics", Hanna publishers, New Delhi. 40th Edition, 2007.
2. "Advanced modern Engineering Mathematics", Glyn James, Pearson Education Ltd,3rd Edition,2007.

## Reference Books :-

1. S.C.Chopra and R.Canale: Numerical methods for Engineers, McGraw Hill edition, 5th edition, 2006.
2. Operation Research-H Taha,Prentice Hall.,2nd edition ,2007
3. Advanced Engineering Mathematics- E. Kreysig-John Wiley, 3rd edition,2007.
4. Linear Algebra and its Applications-David C Lay, Perason Education pvt Ltd.,2005.

## CONTROL SYSTEMS LABORATORY

**Course Code: P08EEL67**  
**Credits : 1.5**

**Total Hours : 36**  
**Hours per Week: 3**

1. Simulation of a typical second order system and determination of step response and evaluation of time- domain specifications and verify using MATLAB
2. (a) To design a passive RC lead compensating network for the given specifications, viz., the maximum phase lead and the frequency at which it occurs and to obtain its frequency response.  
(b) To determine experimentally the transfer function of the lead compensating network.
3. (a) To design RC lag compensating network for the given specifications., viz., the maximum phase lag and the frequency at which it occurs, and to obtain its frequency response.  
(b) To determine experimentally the transfer function of the lag Compensating network.
4. Experiment to draw the frequency response characteristic of a given lag-lead compensating network.
5. To study the effect of P, PI, PD and PID controller on the step response of a feedback control system (using control engineering trainer/process control simulator).
6. Experiment to draw the speed - torque characteristic of a two - phase A.C. servomotor.
7. Experiment to draw speed torque characteristic of a D.C. servomotor.
8. To determine the frequency response of a second -order system and evaluation of frequency domain specifications and verify using MATLAB
9. Obtain the Gain cross over frequency, phase cross over frequency, phase margin and gain margin for a given transfer function by drawing Bode plots. Verify the same using MATLAB
10. To draw the root loci for a given transfer function and to show its breakaway points and imaginary axis crossover point and to obtain the range of K for the stability of the system and verification using MATLAB
11. Draw the Nyquist plot for a given transfer function and verify using MATLAB
12. To draw and study syncro pair characteristics.
13. Determination of the state feedback gain matrix K for the regulator system using Ackermann's formula and verify the same by using MATLAB

## MICROCONTROLLER LABORATORY

**Course Code: P08EEL68**  
**Credits : 1.5**

**Total Hours : 36**  
**Hours per Week: 3**

1. Data transfer Methods
2. Addition & Subtraction of 8-bit & 16-bit data
3. Multiplication & Division of 8-bit & 16-bit data
4. To find the largest and smallest of 8-bit number in a given array
5. Arranging numbers in Ascending & Descending order in a given array
6. Code conversions: Binary to gray , ASCII to BCD, Hexadecimal to decimal & vice versa
7. To find the number of 1's & 0's & to find whether the number is +ve and -ve in an array
8. To search a byte in a given array & to find a square root of given number
9. Sorting of even and odd numbers separately
10. Stepper motor control
11. DC motor control
12. Elevator control
13. Analog to Digital conversion