

SEMESTER V

(Applicable to the students admitted from the Academic year 2006 – 2007 onwards)

THEORY			L	T	P	M
1.		Power Electronics	3	1	0	100
2.		Digital Electronics	3	1	0	100
3.		Transmission & Distribution	3	1	0	100
4.		Object Oriented Programming	3	1	0	100
5.		Integrated Circuits	3	1	0	100
6.		Control Systems	3	1	0	100
PRACTICAL						
1.		Power Electronics Laboratory	0	0	3	100
2.		Control Systems Laboratory	0	0	3	100

SEMESTER V

POWER ELECTRONICS

1 POWER SEMI-CONDUCTOR DEVICES 9

Basic concepts of construction, ratings of SCR, diac, triac, Static V-I characteristics, gate Characteristics, ratings, protection of SCR, turn on and turn off methods, series and parallel Operation of SCRs, switching devices like power transistors, MOSFET, GTO, IGBT etc, Applications.

2 PHASE CONTROLLED CONVERTERS 9

Converter circuits: Single phase half wave, full wave, half controlled and fully controlled With resistive and inductive loads, use of feedback diode, three phase half wave & full wave Converters, Effect of source inductance, single-phase dual converter operation.

3 DC TO DC CHOPPERS 9

Principle of operation of chopper, types of choppers (single, two and four quadrant choppers), step up and step down chopper various commutation methods, voltage commutated chopper and current and load commutated Choppers

4 INVERTERS 9

Types of inverters, operation of 1-phase, 3 phase (120° 180°) modes Series inverter, parallel inverter, voltage source inverters, current source inverters, single phase centre tapped and bridge inverter with resistive load and inductive load. Use of feed back diode, three phase bridge inverters.

5 AC VOLTAGE CONTROLLERS, APPLICATIONS 9

Single-phase AC voltage controller ,multi stage sequence control , step up and step down cycloconverters , three phase to single phase and three phase to three phase cycloconverters, SMPS ,UPS, Resonant Converters : ZVS, ZCS.

TEXT BOOKS

1. Rashid, M.H., 'Power Electronics - Circuits Devices and Applications', Prentice Hall of India, 1995.
2. Singh.M.D and Kanchandani-'Power Electronics'-Tata McGraw-Hill & Hill publication Company Ltd New Delhi-2002.
3. Bhimbra. Dr.P.S., "Power Electronics" Khanna Publishers, 2001

REFERENCES

1. Dubey, G.K., Doradia, S.R., Joshi, A. and Sinha, R.M., 'Thyristorised Power Controllers', Wiley Eastern Limited, 1986.
2. Lander,W., 'Power Electronics', McGraw Hill and Company, Third Edition, 1993
3. Vedam Subramaniam, "Power Electronics", New Age International (P) Publishers Ltd., 2000.

DIGITAL ELECTRONICS

1 NUMBER SYSTEM & BOOLEAN ALGEBRA 11

Review of number system; types and conversion, codes. Boolean algebra: De-Morgan's theorem, switching functions and simplification using K-maps & Quine McCluskey method.

2 COMBINATIONAL CIRCUITS 11

Design of Logic gates. Design of adder, subtractor, comparators, code converters, encoders, decoders, multiplexers and demultiplexers. Function realization using gates & multiplexers.

3 SYNCHRONOUS SEQUENTIAL CIRCUITS 11

Flip flops - SR, D, JK and T. Analysis of synchronous sequential circuits; design of synchronous sequential circuits – Counters, state diagram; state reduction; state assignment.

4 ASYNCHRONOUS SEQUENTIAL CIRCUIT 5

Analysis of asynchronous sequential machines, state assignment, asynchronous design problem.

5 PROGRAMMABLE LOGIC DEVICES, MEMORY AND LOGIC FAMILIES

7

Memories: ROM, PROM, EPROM, PLA, PLD, FPGA, digital logic families: TTL, ECL, CMOS.

L = 45 T = 15 Total = 60

TEXT BOOKS

1. M. Morris Mano, 'Digital Logic and Computer Design', Prentice Hall of India, 2002.
2. John M. Yarbrough, 'Digital Logic, Application & Design', Thomson, 2002.

REFERENCE BOOKS

1. Charles H. Roth, 'Fundamentals Logic Design', Jaico Publishing, IV edition,

2002.

2. Floyd, 'Digital Fundamentals', 8th edition, Pearson Education, 2003.
3. John F.Wakerly, 'Digital Design Principles and Practice', 3rd edition, Pearson Education, 2002.

TRANSMISSION AND DISTRIBUTION

I DISTRIBUTION SYSTEMS 9

Structure of electric power systems - one line diagram – generation, transmission & distribution systems - comparison of distribution systems - Radial & ring - Two wire DC, AC, single phase & three phase systems - current and voltage calculations in distributors with concentrated and distributed loads - Kelvin's law for the design of feeders and its limitations

2 TRANSMISSION LINE PARAMETERS 9

Resistance, inductance and capacitance of single phase transmission lines - stranded and bundled conductors - symmetrical and unsymmetrical spacing - transposition of conductors - Double circuit line - Application of self and mutual GMD - Skin and Proximity effect - Earth effect on capacitance - Inductive interference with neighbouring circuits - Corona characteristics.

3 PERFORMANCE OF TRANSMISSION LINES 9

Equivalent circuits for short, medium and long lines - attenuation constant, phase constant, surge impedance - transmission efficiency and voltage regulation - Real and reactive power flows in lines - Power angle diagram - Power circle diagrams for receiving and sending end - limiting factors for transmission line load ability - Shunt & series compensation - Ferranti effect

4 CABLES AND INSULATORS 9

Under ground cables : constructional features of LT and HT cables - Insulation resistance - Dielectric and grading - Capacitance and inter-sheath grading - Dielectric loss - Thermal characteristics - capacitance of three core cables - fault location - short circuit and open circuit in cables.
Insulators: Types of insulators for overhead lines - Voltage distribution in insulator string and grading - String efficiency - Methods of improving string efficiency.

5 MECHANICAL DESIGN & RECENT TRENDS IN POWER TRANSMISSION 9

Mechanical design of transmission lines - Stress and Sag calculations - effect of wind and ice - supports at different levels - stringing chart - condition of erection. Introduction to HVDC transmission.

TOTAL 45

TEXT BOOKS

1. Wadwa.C.L.' "Electric Power Systems" Wiley Eastern Ltd.' New Delhi 2001.

2. Deshpande.M.V.' "Electrical Power Systems Design" Tata McGraw Hill Publishing Company' New Delhi' 1990.

REFERENCE BOOKS

1. Nagarath.I.J. & Kothari.D.P.' "Modern Power System Analysis" Tata McGraw Hill Publishing Company' New Delhi 1990.
2. Steveson.W.L.' "Elements of Power System Analysis" McGraw Hill' New Delhi.1999

OBJECT ORIENTED PROGRAMMING IN C++

(Common to III SEM CSE & IT, IV SEM BIO-IF, V SEM EEE)

UNIT I : INTRODUCTION TO FUNDAMENTALS CONCEPTS

Object oriented fundamentals- Structure versus object-oriented development, elements of object oriented programming, Fundamentals of OO-class, object, and abstraction and its importance, encapsulation, polymorphism, benefits of OOP, structure of C++ program.

UNIT II : CLASSES AND OBJECTS

Working with classes- Classes and objects-Class specification, class objects, accessing class members, defining member functions, inline functions, accessing member functions with class, data hiding, class member accessibility, empty classes, constructors, parameterized constructors, constructor overloading , copy constructor, new, delete operators, “this” pointer, friend classes and friend functions.

UNIT III : OVERLOADING

Overloading-function overloading, operator overloading- over loadable operators, unary operator overloading, operator keyword, limitations of increment/decrement operators, binary operator overloading, arithmetic operators, concatenation of strings, comparison operators, generic programming with templates-Function templates, class templates.

UNIT IV : INHERITANCE

Inheritance – Base class and derived class relationship, derived class declaration, Forms of inheritance, inheritance and member accessibility, constructors in derived class, destructors in derived class, constructor invocation and data member initialization, data conversion, abstract classes, virtual base classes, virtual functions.

UNIT V : EXCEPTION HANDLING AND FILES

Files and Streams-Opening and Closing a file, file modes, file pointers and their manipulation, sequential access to a file, ASCII and Binary files, random access to a file, error handling during file manipulations, Exception handling-exception handling model, exception handling constructors, list of exceptions, catching exceptions, handling exceptions.

TEXT BOOKS

1. K.R.Venugopal, Rajkumar Buyya, T.Ravishankar, "Mastering C++", TMH, 2003 (Unit I, Unit II, Unit III)

REFERENCES

1. E.Balagurusamy " Object Oriented Programming with C++", TMH 2/e
2. Bjarne Stroustrup, "The C++ programming language", Addison Wesley, 2000

INTEGRATED CIRCUITS

- | | | |
|----------|--|----------|
| 1 | IC FABRICATION | 9 |
| | IC classification, fundamental of monolithic IC technology, epitaxial growth, masking and etching, diffusion of impurities. Realisation of monolithic ICs and packaging. | |
| 2 | CHARACTERISTICS OF OPAMP | 9 |
| | Ideal OP-AMP characteristics, DC characteristics, AC characteristics, offset voltage and current: voltage series feedback and shunt feedback amplifiers, differential amplifier; frequency response of OP-AMP; Basic applications of op-amp – summer, differentiator and integrator. | |
| 3 | APPLICATIONS OF OPAMP | 9 |
| | Instrumentation amplifier, first and second order active filters, V/I & I/V converters, comparators, multivibrators, waveform generators, clippers, clampers, peak detector, S/H circuit, D/A converter, A/D converter. | |
| 4 | SPECIAL ICs | 9 |
| | 555 Timer circuit – Functional block, characteristics & applications; 566-voltage controlled oscillator circuit; 565-phase lock loop circuit functioning and applications, Analog multiplier ICs. | |
| 5 | APPLICATION ICs | 9 |
| | IC voltage regulators - LM317, 723 regulators, switching regulator, MA 7840, LM 380 power amplifier, ICL 8038 function generator IC, isolation amplifiers, opto coupler, opto electronic ICs. | |

TEXT BOOKS

1. Ramakant A.Gayakward, 'Op-amps and Linear Integrated Circuits', IV edition, Pearson Education, 2003 / PHI.
2. D.Roy Choudhary, Sheil B.Jani, 'Linear Integrated Circuits', II edition, New Age, 2003.

REFERENCE BOOKS

1. Jacob Millman, Christos C.Halkias, 'Integrated Electronics - Analog and Digital circuits system', Tata McGraw Hill, 2003.
2. Robert F.Coughlin, Fredrick F.Driscoll, 'Op-amp and Linear ICs', Pearson Education, 4th edition, 2002 / PHI.
3. David A.Bell, 'Op-amp & Linear ICs', Prentice Hall of India, 2nd edition, 1997.

CONTROL SYSTEMS

- | | | |
|----------|--|-----------|
| 1 | BASIC CONCEPTS AND SYSTEM REPRESENTATION | 12 |
| | Terminology and basic structure feedback control theory- multivariable systems – dynamic models – state variable models – impulse response models and transfer function models – application to the mechanical, thermal, hydraulic, pneumatic and electromechanically systems. Block diagram representation and signal flow graphs – control systems components. | |
| 2 | TIME RESPONSE ANALYSIS AND DESIGN | 9 |
| | I and II order systems – performance specifications – feedback analysis- P, PI, PID controllers design – effect of pole, zero addition – desired closed loop pole location – root locus plot and applications – steady state and dynamic error coefficient – robust control. | |
| 3 | FREQUENCY RESPONSE ANALYSIS AND DESIGN | 9 |
| | Performance specification – correlation to time domain specifications – bode plots and polar plots – gain and phase margin – constant M and N circles and Nichols chart – all pass and non – minimum phase systems. | |
| 4 | STABILITY | 9 |
| | BIBO stability – Routh – Hurwitz criterion – stability ranges for a parameters – Nyquist stability criterion – relative stability assessment using Routh and Nyquist criterion and Bode plots. | |

5 COMPENSATION DESIGN

6

Compensation techniques – Lag, Lead, Controllers design in frequency Domain, Concept.

L = 45, T = 15, TOTAL = 60

TEXT BOOK

1. M.Gopal, 'Control System Principles and Design', Tata McGraw-Hill, 1998.

REFERENCES

1. Ogatta, 'Modern Control Engineering', Tata McGraw-Hill 1997.
2. C.J.Chesmond, 'Basic Control System Technology', viva low priced student edition, 1998.
3. I.J.Nagrath and M.Gopal, 'Control System Engineering', Wiley Eastern Ltd., Reprint 1995.
4. K.Datton,W. Banaclough and S.Thompson, 'The Art of Control Engineering', Addison Wesley.
5. R.C.Dorf and R.H.Bishop, 'Modern Control Systems,' Addison Wesley, 1995.
6. N.E.Leonard and William Levine, 'Using MATLAB to Analyse and Design Control Systems', Addison Wesley 1995.

POWER ELECTRONICS LAB

List of experiments:

1. SCR, MOSFET and IGBT Characteristics.
2. SCR half and fully controlled bridge rectifiers
3. SCR series inverter.
4. UJT, R, RC Firing circuits for SCR.
5. Single phase Cycloconverter.
6. Speed control of D.C motor using chopper drives.
7. Thyristorised speed control of 3-phase induction motor.
8. Three phase fully controlled Thyristor converter
9. SCR DC Voltage Commutated Chopper.

10. SCR DC Current Commutated Chopper

11. Resonant Converter

12. IGBT chopper

P=45, TOTAL=45

CONTROL SYSTEMS LABORATORY

1. Transfer function of separately excited DC Generator.
2. Transfer function of self excited DC Generator
3. Transfer function of Armature controlled DC Motor.
4. Transfer function of Field controlled DC Motor.
5. Transfer function of AC Servomotor.
6. Frequency response of Lag, Lead & Lag – Lead networks.
7. Study of Synchros.
8. Study of DC Stepper Motor
9. Transfer function of Ward – Leonard method of speed control of DC motor.
10. Study of DC Position Control system.
11. Study of P, PI and PID Controllers (First Order).
12. Study of various Transducers.

P = 45, TOTAL = 45

