SCHEME OF TEACHING AND EXAMINATION

B.E. ELECTRICAL & ELECTRONICS EINGINEERING

VII SEMESTER

Sl. No.

Subject Code

Title of the Subject

Teaching Dept.

Teaching Hrs / Week

Examination
Theory
Practical
Duration
(Hrs)
Marks
IA
Theory / Practical
Total
1
06EE71

Computer Techniques in		Power System		Analysi

E&EE

4

-

3

25

100

125

2

06EE72

Electrical Power Utilization

E&EE

4
-
3
25
100
125
3
06EE73
High Voltage Engineering
E&EE
4

-

3

25

100

125

4

06EE74

Industrial Drives and Applications

E&EE

4

-

3

25
100
125
5
06EE75x
Elective-II (Group B)
E&EE
4
-
3
25

100
125
6
06EE76x
Elective-III (Group C)
E&EE
4
-
3
25
100
125

7
06EEL77
Relay and High Voltage Laboratory
E&EE
-
3
3
25
50
75
8

06EEL78
Power System Simulation Laboratory
E&EE
-
3
3
25
50
75
Total
24

06

24

200

700

900

Sl.

No.

Elective-II (Group-B)

Elective -III (Group-C)

Sub. Code

	Subject Title
	Sub. Code
	Subject Title
1	
06EE751	
Power System Planning	
06EE761	
Reactive Power Management	
2	
06EE752	
Over Voltages in Power Systems	

06EE763

Energy Auditing and Demand

Side Management

3

06EE753

Testing and Commissioning of

Electrical Equipment

06EE764

Insulation Engineering

4

06EE754

Electrical Engineering Materials

06EE765

Discrete Control Systems

5

06EE755

Digital System Design using

VHDL

06EE766

VLSI Circuits and Design

6

06EE756

Embedded Systems

06EE767

Operating System

7

06EE757

Reliability Engineering

06MS769

Micro and smart systems technology

VII SEMESTER

COMPUTER TECHNIQUES IN POWER SYSTEM ANALYSIS

Subject Code	:	**06EE71**
IA Marks	:	25
No. of Lecture Hrs./ Week	:	04
Exam Hours	:	03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

Part - A

UNIT - 1

Network Topology: Introduction, Elementary graph theory – oriented graph, tree, co-tree, basic cut-sets, basic loops; Incidence matrices – Element-node, Bus incidence, Tree-branch path, Basic cut-set, Augmented cut-set, Basic loop and Augmented loop; Primitive network – impedance form and admittance form.

6 Hours

UNIT - 2

Network Matrices: Introduction, Formation of Y_{BUS} – by method of inspection (including transformer off-nominal tap setting)
, by method of singular transformation (Y
BUS
= A
T
yA); Formation of Bus Impedance Matrix
by step by step building algorithm
(without mutual coupling elements).

6 Hours

UNIT - 3 & 4

Load Flow Studies: Introduction, Power flow equations, Classification of buses, Operating constraints, Data for load flow; Gauss-Seidal Method – Algorithm and flow chart for PQ and PV buses (numerical problem for one iteration only), Acceleration of convergence; Newton Raphson Method – Algorithm and flow chart for NR method in polar coordinates (numerical problem for one iteration only); Algorithm for Fast Decoupled load flow method; Comparison of Load Flow Methods.

14 Hours

Part - B

UNIT - 5 & 6

Economic Operation of Power System: Introduction, Performance curves, Economic generation scheduling neglecting losses and generator limits, Economic generation scheduling including generator limits and neglecting losses; Iterative techniques; Economic Dispatch including transmission losses – approximate penalty factor, iterative technique for solution of economic dispatch with losses; Derivation of transmission loss formula; Optimal scheduling for Hydrothermal plants – problem formulation, solution procedure and algorithm.

12 Hours

UNIT - 7 & 8

Transient Stability Studies: Numerical solution of Swing Equation – Point-by-point method, Modified Euler's method, Runge-Kutta method, Milne's predictor corrector method.

Representation of power system for transient stability studies – load representation, network performance equations. Solution techniques with flow charts.

14 Hours

Text Books:

1. **Computer Methods in Power System Analysis-** Stag, G. W., and El-Abiad, A. H.- McGraw Hill International Student Edition. 1968

2. **Computer Techniques in Power System Analysis**- Pai, M. A- TMH, 2nd edition, 2006.

Reference Books:

1. **Modern Power System Analysis-** Nagrath, I. J., and Kothari, D. P., -TMH, 2003.
2. **Advanced Power System Analysis and Dynamics**- Singh, L. P., New Age International (P) Ltd, New Delhi, 2001.
3. **Computer Aided Power System Operations and Analysis**"- Dhar, R. N- TMH, New Delhi, 1984.
4. **Power System Analysis-** Haadi Sadat, -TMH, 2nd , 12th reprint, 2007

ELECTRICAL POWER UTILIZATION

Subject Code	:	**06EE72**
IA Marks	:	25
No. of Lecture Hrs./ Week	:	04
Exam Hours	:	03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

Part - A

UNIT - 1

Heating and welding: Advantages and methods of electric of heating, resistance ovens, induction heating, dielectric heating, the arc furnace, heating of building, electric welding, resistance and arc welding, control device and welding equipment

10 Hours

UNIT - 2

Electrolytic process: Fundamental principles, extraction, refining of metals, electroplating. Factors affecting electro deposition process, power supply for electrolytic process.

6 Hours

UNIT - 3 & 4

Illumination: Laws of illumination, lighting calculation, factory lighting, flood lighting, street lighting, different types of lamps, incandescent, fluorescent, vapor and CFL and their working, Glare and its remedy

10 Hours

Part - B

Unit - 5, 6 & 7

Electric traction: System of traction, speed time curve, tractive effort at /co-efficient of adhesions, selection of traction motors, method of speed control, energy saving by series parallel control, ac traction equipment. AC series motor, characteristics, regenerative braking, linear induction motor and their use. AC traction, diesel electric equipment, train lighting system, specific energy, factors affecting specific energy consumption.

20 Hours

UNIT - 8

Introduction Electric and Hybrid Vehicles: Configuration and performance of electrical vehicles, traction motor characteristics, tractive effort, transmission requirement, vehicle performance and energy consumption

6 Hours

Text Books:

1. **Utilization Of Electric Energy-** Openshaw Taylor
2. **Modern Electric, Hybrid Electric and Fuel Cell Vechiles**- Mehrdad, Ehsani, Yimin Gao, Sabastien. E. Gay, Ali Emadi- CRC Press.

Reference Books:

1. **A Course in Electrical Power**- Soni Gupta and Bhatnager-Dhanapat Rai & sons.

1. **Electrical Power** by Dr. S.L.Uppal Khanna Publications

HIGH VOLTAGE ENGINEERING

Subject Code	:	**06EE73**
IA Marks	:	

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

Part - A

UNIT - 1

Introduction: Introduction to HV technology, advantages of transmitting electrical power at high votages, need for generating high voltages in laboratory. Important applications of high voltage.

4 Hours

UNIT - 2 & 3

Breakdown phenomena: Classification of HV insulating media. Properties of important HV insulating media under each category. Gaseous dielectrics: Ionizations: primary and secondary ionization processes. Criteria for gaseous insulation breakdown based on Townsend’s theory.

Limitations of Townsend's theory. Streamer's theory breakdown in non uniform fields. Corona discharges. Breakdown in electro negative gasses. Paschen's law and its significance. Time lags of Breakdown. Breakdown in solid dielectrics: Intrinsic Breakdown, avalanche breakdown, thermal breakdown, and electro mechanic breakdown. Breakdown of liquids dielectric dielectrics: Suspended particle theory, electronic Breakdown, cavity breakdown (bubble's theory), electro convection breakdown.

12 Hours

UNIT - 4

Generation of HV AC and DC Voltage: HV AC-HV transformer; Need for cascade connection and working of transformers units connected in cascade. Series resonant circuit- principle of operation and advantages. Tesla coil. HV DC- voltage doubler circuit, cock croft- Walton type high voltage DC set. Calculation of high voltage regulation, ripple and optimum number of stages for minimum voltage drop

8 Hours

Part - B

Unit - 5

Generation of Impulse Voltage and Current: Introduction to standard lightning and switching impulse voltages. Analysis of single stage impulse generator-expression for Output impulse voltage. Multistage impulse generator working of Marx impulse. Rating of impulse generator. Components of multistage impulse generator. Triggering of impulse generator by three electrode gap arrangement. Triggering gap and oscillograph time sweep circuits. Generation of switching impulse voltage. Generation of high impulse current.

6 Hours

UNIT - 6

Measurement of high voltages: Electrostatic voltmeter-principle, construction and limitation. Chubb and Fortescue method for HV AC measurement. Generating voltmeter- Principle, construction. Series resistance micro ammeter for HV DC measurements. Standard sphere gap measurements of HV AC, HV DC, and impulse voltages; Factors affecting the measurements. Potential dividers-resistance dividers capacitance dividers mixed RC potential dividers. Surge current measurement-Klydanograph and magnetic links.

12 Hours

UNIT - 7

Non-destructive insulation testing techniques: Dielectric loss and loss angle measurements using Schering Bridge, Transformer ratio Arms Bridge. Need for discharge detection and PD

measurements aspects. Factor affecting the discharge detection. Discharge detection methods-straight and balanced methods.

6 Hours

UNIT - 8

High voltage tests on electrical apparatus: Definitions of terminologies, tests on isolators, circuit breakers, cables insulators and transformers

4 Hours

Text Books:

1. **High Voltage Engineering Fundamentals**- E. Kuffel and W.S. Zaengl- 2nd edition, Elsevier, press, 2005.

2. **High Voltage Engineering**- M.S.Naidu and Kamaraju- 3rd Edition, THM, 2007.
3. **High Voltage Engineering** -C.L.Wadhwa, New Age International Private limited, 1995.

Reference books:

1. **Extra High Voltage AC Transmission Engineering -**Rakosh Das Begamudre, Wiley Eastern limited, 1987.

2. **Transmission and Distribution Reference Book**-Westing House.

3. **High Voltage Technology**- L. L. Alston- BSB Publication, 2007.

INDUSTRIAL DRIVES & APPLICATIONS

Subject Code	:	**06EE74**
IA Marks	:	25

No. of Lecture Hrs./ Week	
:	
04	
Exam Hours	
:	
03	
Total No. of Lecture Hrs.	
:	
52	
Exam Marks	
:	
100	

PART - A

UNIT - 1

An Introduction to Electrical drives & its dynamics: Electrical drives. Advantages of electrical drives. Parts of electrical drives, choice of electrical drives, status of dc and ac drives, Dynamics of electrical drives,
Fundamental torque equation, speed torque conventions and multiquadrant operation. Equivalent values of drive parameters, components of low torques, nature and classification of load torques, calculation of time and energy loss in transient operations, steady state stability, load equalization.

9 Hours

UNIT - 2

Selection of motor power rating: Thermal model of motor for heating and cooling, Classes of motor duty, determination of motor rating.

5 Hours

UNIT - 3 & 4

D C Motor Drives:

(a) Starting braking, transient analysis, single phase fully controlled rectifier, control of dc separately excited motor, Single-phase half controlled rectifier control of dc separately excited motor.

(b) Three phase fully controlled rectifier control of dc separately excited motor, three phase half controlled controlled rectifier control of dc separately excited motor, multiquadrant operation of dc separately excited motor fed form fully controlled rectifier. Rectifier control of dc series motor, chopper controlled dc drives, chopper chopper control of separately excited dc motor. Chopper control of series motor.

12 Hours

PART - B

UNIT - 5 & 6

Induction motor Drives:

(a) Operation with unbalanced source voltage and single phasing, operation with unbalanced rotor impedances, analysis of induction motor fed from non-sinusoidal voltage supply, starting braking, transient analysis.

(b) Stator voltage control variable voltage frequency control from voltage sources , voltage source inverter control, closed loop control, current source inverter control, current regulated voltage source inverter control, rotor resistance control, slip power recovery, speed control o f single phase induction motors.

12 Hours

UNIT - 7

Synchronous motor Drives: Operation form faced frequency supply, synchronous motor variable speed drives, variable frequency control of multiple synchronous motors.
Self-controlled synchronous motor drive employing load commutated thruster inverter.

10 Hours

UNIT - 8

Industrial Drives: Rolling mill drives, cement mill drives, paper mill dries and textile mill drives.

4 Hours

Text Book:

1. **Fundamentals of Electrical Drives**"- G.K Dubey -2 Edition, 5th reprint Narosa publishing house Chennai, 2002.

Reference Books:

1. **Electrical Drives**- N.K De and P.K. Sen- PHI, 2007
2. **A First Course On Electric Drives**- S.K Pillai-Wiley Eastern Ltd 1990.
3. **Power Electronics, Devices, Circuits and Industrial Applications**- V.R. Moorthi, "Oxford University Press, 2005.

ELECTIVE-II (GROUP B)

POWER SYSTEM PLANNING

Subject Code	**06EE751**
IA Marks	25
No. of Lecture Hrs./ Week	04
Exam Hours	

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

Part - A

UNIT - 1

Introduction of power planning, National and regional planning, structure of power system, planning tools, electricity regulation, Load forecasting, forecasting techniques, modeling

8 Hours

UNIT - 2 & 3

Generation planning, Integrated power generation, co-generation / captive power, power pooling and power trading, transmission & distribution planning, power system economics, power sector finance, financial planning, private participation, rural electrification investment, concept of rational tariffs

10 Hours

UNIT - 4

Computer aided planning: Wheeling, environmental effects, green house effect, technological impacts, insulation co-ordination, reactive compensation

8 Hours

Part - B

UNIT - 5 & 6

Power supply reliability, reliability planning, system operation planning, load management, load prediction, reactive power balance, online power flow studies, test estimation, computerized management. Power system simulator .

10 Hours

UNIT - 7 & 8

Optimal Power system expansion planning, formulation of least cost optimization problem incorporating the capital, operating and maintenance cost of candidate plants of different types (thermal hydro nuclear non conventional etc), Optimization techniques for solution by programming

16 Hours

Text Book:

1. **"Electrical Power System Planning"** A.S.Pabla, Macmillan India Ltd, 1998

OVER VOLTAGES IN POWER SYSTEM

Subject Code	:	**06EE752**
IA Marks	:	25
No. of Lecture Hrs./ Week	:	04

Exam Hours	
:	
03	
Total No. of Lecture Hrs.	
:	
52	
Exam Marks	
:	
100	

Part - A

UNIT - 1 & 2

Introduction to over voltages phenomenon in power system: transient on transmission lines: infinite line definition and its transient behavior, finite line analyses, analysis for different line terminations, problems. Bewely lattice diagram, problems.

15 Hours

UNIT - 3 & 4

Use of transients network analyzer, digital and hybrid computers for solving large scale problems, characteristics of lightning discharges, theory of cloud formation origin of lightning, iso-Keronic level, leader development, return stroke, different types of lightning interaction, back flash over

11 Hours

Part - B

UNIT - 5 & 6

Shielding angle calculation for line, grounding rods, counter poise, problems, origin and characteristics of switching over voltages and temporary over voltages, problems of switching surges.

11 Hours

UNIT - 7 & 8

Behavior of apparatus and line insulation under all types of over voltages, concept of BIL, protection of apparatus against over voltages, surge arresters, insulation co-ordination

15 Hours

Text Book:

1. **"Power System Transients"-**Greenwood, , Orient Longman 1987

Reference Books:

1. **Extra High Voltage AC Transmission Engineering -**Rakesh Das Begamudre, Willey Eastern Limited. 1987
2. **"High Voltage Engineering Fundamentals"** E.Kuffel and W.S.Zaengal, and J. Kuffel 2nd Edition, Elsevier, 2005.
3. **High Voltage Engineering -**M.S.Naidu and V.Kamaraju, 3rd Edition, TMH, 2007.
4. **"High Voltage Engineering" -**R. S. Jha "High Voltage Engineering", Khanna publishers
5. **"High Voltage Engineering"-** C.L.Wadhwa, New age international

TESTING AND COMMISSIONING OF

ELECTRICAL EQUIPMENT

Subject Code	:	**06EE753**
IA Marks		

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

Part - A

UNIT - 1 & 2

TRANSFORMERS:

a. Specifications: Power and distribution transformers as per BIS standards.

b. Installation: Location, site, selection, foundation details (like bolts size, their number, etc), code of practice for terminal plates, polarity & phase sequence, oil tanks, drying of windings and general inspection.

5 Hours

c. Commissioning tests: Following tests as per national & International Standards, volt ratio test, earth resistance, oil strength, Bucholz & other relays, tap changing gear, fans & pumps, insulation test, impulse test, polarizing index, load & temperature rise test.

7 Hours

d. Specific Tests: Determination of performance curves like efficiency, regulation etc, and determination of mechanical stress under normal &abnormal conditions.

3 Hours

UNIT - 3 & 4

SYNCHRONOUS MACHINES:

a. Specifications: As per BIS standards.

b. Installation: Physical inspection, foundation details, alignments, excitation systems, cooling and control gear, drying out.

c. Commissioning Tests: Insulation, Resistance measurement of armature & field windings, waveform & telephone interference tests, line charging capacitance.

4 Hours

d. Performance tests: Various tests to estimate the performance of generator operations, slip test, maximum lagging current, maximum reluctance power tests, sudden short circuit tests, transient & sub transient parameters, measurements of sequence impedances, capacitive reactance, and separation of losses, temperature rise test, and retardation tests.

6 Hours

e. Factory tests: Gap length, magnetic eccentricity, balancing vibrations, bearing performance

2 Hours

Part - B

UNIT - 5, 6 & 7

INDUCTION MOTORS:

a. **Specifications** for different types of motors, Duty, I.P. protection.

2 Hours

b. Installation: Location of the motors (including the foundation details) & its control apparatus, shaft & alignment for various coupling, fitting of pulleys & coupling, drying of windings.

4 Hours

c. Commissioning Test: Mechanical tests for alignment, air gap symmetry, tests for bearings, vibrations & balancing.

5 Hours

Electrical Tests: Insulation test, earth resistance, high voltage test, starting up, failure to speed up to take the load, type of test, routine test, factory test and site test (in accordance with ISI code

4 Hours

d. Specific Tests: Performance & temperature raise tests, stray load losses, shaft alignment, and re-rating & special duty capability.

4 Hours

UNIT - 8

SWITCH GEAR & PROTECTIVE DEVICES: Standards, types, specification, installation, commissioning tests, maintenance schedule, type & routine tests.

6 Hours

Text Books:

1. **Testing & Commissioning Of Electrical Equipment -**S. Rao,
2. **Testing & Commissioning Of Electrical Equipment** -B .V. S. Rao,

Reference Books:

1. Relevant Bureau of Indian Standards
2. **"A Handbook on Operation and Maintenance of Transformers"-**H. N. S. Gowda,
3. **Transformer & Switch Gear Handbook** -Transformers-BHEL, J &P, J & P

ELECTERICAL ENGINEERING MATERIALS

Subject Code

:

06EE754

IA Marks

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

UNIT - 1

Conducting materials: Review of metallic conduction on the basis of free electron theory Fermi-Dirac distribution – variation of conductivity with temperature and composition, materials for electric resistors- general electric properties; brushes of electrical machines, lamp filaments, fuses and solder.

6 Hours

UNIT - 2

Semiconductors: Mechanism of conduction in semiconductors, density of carriers in intrinsic semiconductors, the energy gap, types of semiconductors. Hall effect, compound semiconductors, basic ideas of amorphous and organic semiconductors. Magnetic materials: Classification of magnetic materials- origin of permanent magnetic dipoles, ferromagnetism, hard and soft magnetic materials magneto materials used in electrical machines, instruments and relays.

10 Hours

UNIT - 3 & 4

Dielectrics: Dielectrics polarization under static fields- electronic ionic and dipolar polarizations, behavior of dielectrics in alternating fields, Factors influencing dielectric strength and capacitor materials. Insulating materials, complex dielectric constant, dipolar relaxation and dielectric loss.

Insulating materials: Inorganic materials (mica, glass, porcelain, asbestos), organic materials (paper, rubber, cotton silk fiber, wood, plastics and bakelite), resins and varnishes, liquid insulators (transformer oil) gaseous insulators (air, SF6 and nitrogen) and ageing of insulators.

10 Hours

PART - B

UNIT - 5

Materials for Special applications: Materials for solar cells, fuel cells and battery. Materials for coatings for enhanced solar thermal energy collection and solar selective coatings, Cold mirror coatings, heat mirror coatings, antireflection coatings, sintered alloys for breaker and switch contacts.

6 Hours

UNIT - 6

Modern Techniques for Materials studies: Optical microscopy, Electron microscopy, Photo electron spectroscopy, Atomic absorption spectroscopy, magnetic resonance, nuclear magnetic resonance, electron spin resonance and ferromagnetic resonance.

6 Hours

UNIT - 7

Introduction Properties and Application of Piezoelectric materials, Eletrostrictive materials, Ferromagnetic materials, Magnetosrtictive materials, Shape memory alloys, Electro archeological fluids, Magneto archeological fluids, Smart hydrogels

6 Hours

UNIT - 8

Ceramics: properties, application to conductors, insulator & capacitors

Plastics: Thermoplastics, rubber, thermostats, properties.

8Hours

Text Books:

1. **"An Introduction to Electrical Engineering"-** Indulkar C.S. & Thiruvengadam. S.

2. **"Electrical Engineering Materials"-**Yu Koritsky, MIR
3. **"Materials Science for Electrical & Electronics Engineering"**-Ian P.Jones. Oxford University Press,2007

4. **"Materials Science"-**Arumugam M, Anuradha Publishers, 1990
5. **"Applied Solar Energy"**-An Introduction -Meinal A.B Meinal M P, – An Introduction., Addison Wesley Publications,

6. **"Electrical Engineering Materials"-**Kapoor P L., Khanna Publications.

DIGITAL SYSTEM DESIGN USING VHDL

Subject Code	:
06EE755	
IA Marks	:
25	

No. of Lecture Hrs./ Week	
:	
04	
Exam Hours	
:	
03	
Total No. of Lecture Hrs.	
:	
52	
Exam Marks	
:	

100

PART - A

UNIT - 1

Introduction: VHDL description of combinational networks, Modeling flip-flops using VHDL, VHDL models for a multiplexer, Compilation and simulation of VHDL code, Modeling a sequential machine, Variables, Signals and constants, Arrays, VHDL operators, VHDL functions, VHDL procedures, Packages and libraries, VHDL model for a counter.

7 Hours

UNIT - 2

Designing With Programmable Logic Devices: Read-only memories, Programmable logic arrays (PLAs), Programmable array logic (PLAs), Other sequential programmable logic devices (PLDs), Design of a keypad scanner.

6 Hours

UNIT - 3

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.

6 Hours

UNIT - 4

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.

6 Hours

PART - B

UNIT - 5

Designing With Programmable Gate Arrays And Complex Programmable Logic Devices: Xlinx 3000 series FPGAs, Designing with FPGAs, Xlinx 4000 series FPGAs, using a one-hot state assignment, Altera complex programmable logic devices (CPLDs), Altera FELX 10K series COLDs.

6 Hours

UNIT - 6

Floating-Point Arithmetic: Representation of floating-point numbers, Floating-point multiplication, Other floating-point operations.

7 Hours

UNIT - 7

Additional Topics In Vhdl: Attributes, Transport and Inertial delays, Operator overloading, Multivalued logic and signal resolution, IEEE-1164 standard logic, Generics, Generate statements, Synthesis of VHDL code, Synthesis examples, Files and TEXTIO.

7 Hours

UNIT - 8

VHDL Models For Memories And Buses: Static RAM, A simplified 486 bus model, interfacing memory to a microprocessor bus.

7 Hours

Text Books:

1. **Digital Systems Design Using VHDL,-** Thomson Learning **-**Charles H. Roth. Jr: Inc, 2002.
2. **Digital Electronics And Design With VHDL -** A. Pedroni, Volnet Elsevier, 1st edition, 2008

Reference Books:

1. **Fundamentals of Digital Logic with VHDL Design -**Stephen Brwon & Zvonko Vranesic, Tata McGraw-Hill, New Delhi, 2003
2. **Digital Fundamentals using VHDL -**Floyd, Pearson Education, 2003,
3. **VHDL Primer**, -J. Bhaskar Pearson / PHI, NewDelhi, 2003

EMBEDDED SYSTEMS

Subject Code	:
06EE756	
IA Marks	:
25	
No. of Lecture Hrs./ Week	:
04	

Exam Hours	
:	
03	
Total No. of Lecture Hrs.	
:	
52	
Exam Marks	
:	
100	

PART - A

UNIT - 1 & 2

Concept of embedded system design: Components, classification, skills required.Embedded Micro controller cores: Architecture of 6808 and 6811.Embedded Memories ROM variants, RAM.Applications of embedded system: Examples of Embedded systems SOC for cellless bar code scanner.

10 Hours

UNIT - 3

Technological aspects of Embedded System: Interfacing between analog and digital blocks, Signal conditioning, digital signal processing,
DAC & ADC interfacing, Sample & hold, multiplexer interface Internal ADC interfacing (excluding 6805 & 6812), Data Acquisition System and Signal conditioning using DSP.

12 Hours

UNIT - 4

Design trade offs due to process incompatibility, thermal considerations: Issues in embedded system design. Design challenge, design technology, trade offs. Thermal considerations

6Hours

PART - B

UNIT - 5 & 6

Software aspects of Embedded Systems, real time programming Languages, operating systems. Programming concepts and embedded programming in C.Round Robin, Round Robin with interrupts, function queue-scheduling architecture, Real time OS architecture, selecting architecture. Introduction to RTOS.

12 Hours

UNIT - 7 & 8

Subsystem interfacing with external systems user interfacing, Serial I/O devices, Parallel port interfaces: Input switches, Key boards and Memory interfacing.

12 Hours

Text Books:

1. **"Embedded Microcomputer systems : Real time interfacing"-** Valvano, J.W, Brooks/Cole, 2000
2. "**The Art of Designing Embedded systems**"- Ganssle, Jack, Newness
3. **"Embedded System, Architecture, Programming and Design"-** Raj Kamal TMH 2003.

Reference Books:

1. **"A Unified Hardware/Software Introduction"-**Frank Vahid/Tony Givargis, Wiely student edition 2002
2. **Motorola and Intel Manuals**

RELIABILITY ENGINEERING

Subject Code	
:	
06EE757	
IA Marks	
:	
25	
No. of Lecture Hrs./ Week	
:	
04	
Exam Hours	
:	
03	

Total No. of Lecture Hrs.	:
52	
Exam Marks	:
100	

PART - A

UNIT - 1

Introduction: Concept of reliability, reliability indices, component reliability –Introduction, non repairable component, hazard models, components with preventive maintenance, repairable

components.

8 Hours

UNIT - 2

System reliability: network methods, Introduction; series configuration parallel configuration, mixed configuration, the r out of n configuration d composition method minimal-tie and minimal –cut methods logic diagrams.

8 Hours

UNIT - 3 & 4

System reliability state space method system representation basic concepts state probability state frequency and duration system of two independent component two components with dependent failures combining states failure effect analysis state enumeration methods

10 Hours

PART - B

UNIT - 5

System reliability other methods dependent failure models for non repairable components fault tree analysis monte- carlo simulation

8 Hours

UNIT - 6 & 7

Basic probability theory probability concepts permutation and combination practical engineering concepts venn diagram rules for combining probabilities, probability distribution random variables density and distribution

10 Hours

UNIT - 8

System reliability evaluation using probability distribution series system parallel system partially redundant system mean time to failure stand by system

8 Hours

Text Books:

1. **"Concepts in reliability engineering"-** L S Srinath, East West Press Ltd, 2nd edition.
2. **"Reliability modeling in electrical power system"-** J. Endrenyi, John Wiley & Sons

Reference Book:

1. **"Reliability Evaluation of Engineering Systems"-** Roy Billintan & Ronald. N. Allar, 2nd Edition, 1992.

ELECTIVE-III (GROUP C)

REACTIVE POWER MANAGEMENT

Subject Code	**06EE761**
IA Marks	25
No. of Lecture Hrs./ Week	04
Exam Hours	

03	
Total No. of Lecture Hrs.	:
52	
Exam Marks	:
100	

PART – A

UNIT – 1

Introduction, Importance of reactive power control in EPS, Reactive power devices.

4 Hours □□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□□

UNIT – 2

Theory of Load Compensation : Introduction- Requirement for compensation, Objectives in load compensation, Specifications of a load compensator , Power factor correction and voltage regulations in single phase system, Phase balancing and p. f. correction of unsymmetrical loads, Compensation in term of symmetrical components.

8 Hours

UNIT – 3

Reactive Power Control: Fundamental requirement in AC Power transmission, Fundamental transmission line equation, Surge impedance and natural loading, Voltage and current profiles of uncompensated radial and symmetrical line on open circuit, Uncompensated line under load, Effect of line length, Load power and p. f on voltage and reactive power.

8 Hours

UNIT – 4

Passive and active compensators, Uniformly distributed fixed compensation, Passive shunt compensation, Control of open circuit voltage by shunt reactance, Reactance of shunt reactors, multiple shunt reactors along the line.

8 Hours

PART – B

UNIT - 5

Series compensation: Objectives and practical limitation , Symmetrical line with mid-point series capacitor and shunt reactor, Power transfer characteristics and maximum transmissible power for a general case, Fundamental concepts of compensation by sectioning.

6 Hours

UNIT - 6

Principles of Static Compensation: Principle of operation of thyristor controlled reactor, Thyristors switched capacitor. Series Capacitors: Introduction , protective gear, reinsertion schemes, Varistor protective gear.

8 Hours

UNIT – 7

Synchronous Condenser: Introduction, Power system Voltage control, Emergency reactive power supply, Starting methods, starting motor, reduced voltage starting, static starting.

6 Hours

UNIT – 8

Harmonics effects, resonance, shunt capacitors and filters, telephone interferences, Reactive Power Co-ordination,
Reactive power management, transmission benefits, reactive power dispatch & equipment impact.

8Hours

TEXT BOOKS:

1. “Reactive power control in electric power systems”- T. J. E. Miller, John Wiley & Sons NY 1982.
2. “Reactive Power Management” – D. Tagare, Tata McGraw-Hill Publishing Company Limited.

REFERENCE BOOKS:

1. Power System Stability and Control, Chapter-11, P. Kundur, McGraw-Hill, Inc.
2. Voltage Stability, C. W. Taylor, McGraw-Hill, Inc.

ENERGY AUDITING AND DEMAND SIDE MANAGEMENT

Subject Code	:	**06EE763**
IA Marks	:	25
No. of Lecture Hrs./ Week	:	04
Exam Hours	:	03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

UNIT - 1

INTRODUCTION: Energy situation – world and India, energy consumption, conservation, Codes, standards and Legislation.

6 Hours

UNIT - 2

ENERGY Economic Analysis: The time value of money concept, developing cash flow models, payback analysis, depreciation, taxes and tax credit – numerical problems.

7 Hours

UNIT - 3

ENERGY Auditing: Introduction, Elements of energy audits, energy use profiles, measurements in energy audits, presentation of energy audit results.

8 Hours

UNIT - 4

ELECTRICAL System Optimization: The power triangle, motor horsepower, power flow concept.

4 Hours

PART - B

UNIT - 5 & 6

Electrical Equipment and power factor –correction & location of capacitors, energy efficient motors, lighting basics, electrical tariff, Concept of ABT.

10 Hours

UNIT - 7 & 8

Demand Side Management: Introduction to DSM, concept of DSM, benefits of DSM, different techniques of DSM – time of day pricing, multi-utility power exchange model, time of day models for planning, load management, load priority technique, peak clipping, peak shifting, valley filling, strategic conservation, energy efficient equipment. Management and Organization

of Energy Conservation awareness Programs.

16 Hours

Text Books:

1. "**Industrial Energy Management Systems" -** arry C. White, Philip S. Schmidt, David R. Brown, Hemisphere Publishing Corporation, New York.

2. **"Fundamentals of Energy Engineering" -** Albert Thumann, Prentice Hall Inc, Englewood Cliffs, New Jersey.

3. **Electrical distribution**, Pabla TMH, 2004.

Reference Books:

1. "**Recent Advances in Control and Management of Energy Systems**"- D.P.Sen, K.R.Padiyar, Indrane Sen, M.A.Pai, Interline Publisher, Bangalore, 1993.

2. **"Energy Demand – Analysis, Management and Conservation"-**Ashok V. Desai, Wiley Eastern.

3. **"Demand Side Management"-**Jyothi Prakash, TMH Publishers.

4. **Hand book on energy auditing** - TERI (Tata Energy Research Institute)

INSULATION ENGINEERING

Subject Code	:
06EE764	
IA Marks	:
25	
No. of Lecture Hrs./ Week	

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

UNIT - 1

Electrostatic Field, their Control and Estimations: Electric Field Intensity, Electric Strength, Classification of Electric Fields, Degree of Uniformity of Electric Fields, control of Electric field Intensity (stress control), Estimation of Electric Field Intensity, Basic Equations for potential and Field Intensity in Electrostatic Fields, Analysis of Electric Field Intensity in Homogeneous Isotropic single dielectric only direct solution of Laplace equation, Analysis of Electric field Intensity in Isotropic Multidielectric system.

7 Hours

UNIT - 2

Insulation system in power system apparatus: Insulation system in capacitors, bushings, and transformers modes of failure of insulation systems. Insulation in rotating machines.

6 Hour

UNIT - 3

Dielectric phenomena: Dielectric phenomena in in solid insulation. Macroscopic approach for describing the Dielectric phenomena microscopic treatment for Dielectric phenomena

7 Hours

UNIT - 4

Properties of insulation materials: Introduction to properties of solid insulating materials (both of natural origin and synthetic types) Properties of liquid insulating materials,

6 Hours

PART - B

UNIT - 5

Gaseous insulation: Requirement of gaseous insulation. Breakdown process: types of collision, Elastic and inelastic, collision cross-section, Mobility of ions, Diffusion of charges, Emission of radiation and excitation, various secondary process and recombination, Mobility controlled and diffusion controlled breakdown.

9 Hours

UNIT - 6

Ageing phenomena: Failure of electric insulation due to ageing. Ageing mechanisms- Thermal ageing, Electrical ageing, combined thermal and electrical ageing.

9 Hours

UNIT - 7

Analysis of insulation failure date Power law model, Graphical estimation of power law constants, ageing date, plotting position and cumulative probability.

8 Hours

Text Books:

1. "**Fundamentals of gaseous ionization and plasma electronics"-** Nasser E. John Wiley Interscience, New York, 1971.

2. "**Methods of statistical analysis and life data"-** Hann N.R. Schafer R.E. and Singapore wall N.D. John Wiley and sons, New York, 1974.

3. "**Theory of electric polarization**"- Bother C.J.F. Elsevier Publications.

4. **"High Voltage Insulation Engineering"** -Ravindra Arora, Wolfgang Mosch, New age International Publishers Ltd.

Reference Books:

1. **"Electrical insulation"-** Bradwell A. Peter Peregrinus Ltd, London, 1993.
2. **Electrical breakdown of gass"-** J.M. Meek and J.D. Craggs, "Oxford university press, 11953
3. **,"High voltage Engineering fundamentals"-**E. Kufell and W.S. Zaengl, and J.

Kufell, 2nd edition, Elsevier 2005
4. **"High voltage Engineering"**-M.S. Naidu and V Kamaraju, 3rd edition, TMH, 2007.

DISCRETE CONTROL SYSTEM

Subject Code	**06EE765**
IA Marks	25
No. of Lecture Hrs./ Week	

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

UNIT - 1 & 2

Z-Plane Analysis of Discrete-time Control Systems: Impulse Sampling and data Hold, obtaining the Z-transform by convolution integral method, reconstruction the original signals from sampled signals, the pulse transfer function, realization of digital controllers and digital filters

10 Hours

UNIT - 3 & 4

Design of discrete time control systems by convolution methods: Mapping between the s-plane and the z-plane, stability analysis of closed loop systems in the z-plane, transient and steady state response analysis design based on the root locus method, design based on frequency response method, analytical design method.

16 Hours

PART - B

UNIT - 5 & 6

State space analysis: State space representation of discrete time systems, solution of discrete time state space equations, pulse transfer functions matrix, discretization of continuous time state space equations, Liapunov stability analysis.

12 Hours

UNIT - 7 & 8

Pole placement and Observer Design: Controllability, observability, useful transformations in state space analysis and design, design via pole placement, state observers, and servo systems.

14 Hours

Text Book:

1. **"Discrete-Time Control Systems"**-Kutsuhiko Ogata, 2nd Edition, Pearson Education, 2003.

Reference Books:

1. **"Digital Control and State Variable Methods"-**M. Gopal, 2nd Edition, TMH, 2007.
2. **"Modern Control System"-** Richard C. Dorf, Robert H. Bishop, 11th Edition Pearson Education, 2008.
3. **"Discrete Control Systems"-**John F. Dorsey, TMH.
4. **"Digital Control System"-** Moudalya, K.M., John Wiley & Sons, 2007

VLSI CIRCUITS AND DESIGN

Subject Code

:

06EE766

IA Marks

:

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

UNIT - 1

A Review of Microelectronic 3 and an introduction to mos technology: Introduction to integrated circuit technology, Production of E-beam masks. Introduction, VLSI technologies, MOS transistors, fabrication, thermal aspects, production of E-beam masks.

6 Hours

UNIT - 2

Basic Electrical properties of mos an bicmos circuit: Rain to source current Ids versus Vds relationships-BICMOS latch up susceptibility. MOS transistor characteristics, figure of merit, pass transistor NMOS and COMS inverters, circuit model, latch up.

8 Hours

UNIT - 3

Mos and bicmos circuit design PROCESSES: Mass layers, strick diagrams, design, symbolic diagrams

8 Hours

UNIT - 4

Basic circuit CONCEPTS: Sheet resistance, capacitance layer inverter delays, wiring capacitance, choice of layers.

6 Hours

PART - B

UNIT - 5

Scaling of mos CIRCUITS: Scaling model and scaling factors- Limit due to current density.

8 Hours

UNIT - 6

Subsystem design and layout: Some architecture issues- other systems considerations. Examples of structural design, clocked sequential circuits

8 Hours

UNIT - 7

Subsystem design processes: Some general considerations, an Illustration of design process, observations

4 Hours

UNIT - 8

Illustration of the design process: Observation on the design process, Regularity Design of an ALU subsystem. Design of 4-bit adder, implementing A LU functions.

4 Hours

Text Books:

1. **"Basic VLSI Design" -3rd** Edition, PHI
2. **"Fundamentals of Modern VLSI Devices"-**Yuan Taun Tak H Ning Cambridge Press, South Asia Edition 2003,
3. **"ModernVLSI Design Wayne wolf", Pearson Education Inc. 3rd edition"-**Wayne wolf 2003.

OPERATING SYSTEMS

Subject Code	
:	
06EE767	
IA Marks	
:	
25	
No. of Lecture Hrs./ Week	
:	

04	
Exam Hours	
:	
03	
Total No. of Lecture Hrs.	
:	
52	
Exam Marks	
:	
100	

PART - A

UNIT - 1

Introduction to operating systems and their classifications: What is an operating system, Main frame systems, Desktop systems, Multiprocessor system, Distributed system, Clustered system, Real time system, Hand held system, Feature migration, Computing environments.

5 Hours

UNIT - 2

Operating system structures: System components, OS services, System calls, System programs, System structure, Virtual machines.

3 Hours

UNIT - 3

Process, Inter process Communication, Threads & CPU Scheduling: Process concept, Process scheduling, Operation on processes, Co-operating processes, Inter Process communication. Threads – Overview, Multithreading models, Threading issues, P threads, Java threads. CPU Scheduling – Basic concepts, Scheduling criteria, Scheduling algorithms, Multiple processor Scheduling, Real time Scheduling.

8 Hours

UNIT - 4

Process Synchronization and handling Deadlocks: The critical section problem, Synchronization hardware, Semaphores, Classical problems of Synchronization, Critical regions, Monitors. Deadlock- System model, Dead lock characterization, Methods for handling Dead locks- Deadlock prevention, dead lock avoidance, Dead lock detection and recovery from deadlock.

10 Hours

PART - B

UNIT - 5

Storage Management: Main memory management – Background, Swapping, Contiguous allocations, Paging, Segmentation, Segmentation with paging.

5 Hours

UNIT - 6

Virtual memory – Background, Demand paging, Process creation, Page replacement algorithms, Allocation of frames, Thrashing.

5 Hours

UNIT - 7

File system interface - File concept, Access methods, Directory structure, File system mounting, File system implementation, Directory implementation, Allocation methods, free space management.

5 Hours

Protection and Security: Goals of protection, Domain of protection, Access matrix, Implementation of access matrix, Revocation of access rights, The security problem, Authentication, Program threats, System threats, Securing systems and facilities, Intrusion detection, Cryptography.

4 Hours

UNIT - 8

Introduction to distributed operating systems: Background, Topology, Network types, Communication, Co-protocols, Robustness, design issues.

4 Hours

Case Study- Linux Operating system: Design principles, Kernel modules, Process management, Memory management, and File systems, Input and Output, Communication.

3 Hours

Text Book:

1. **"Operating System Concepts"-**Abraham Silberschatz, Peter Baer Galvin, Greg Gagne 6th Edition, Wiley Indian Edition, reprint 2007.

References Books:

1. **"Operating System Concepts and design"-** 2nd edition, Milan Milankovic McGrawhill 1992.
2. **"Operating system"**- Harvey M Deital, Addison Wesley 1990.
3. **Operating System** –A Concept Based Approch –D.M.Dhamdhere.TMH,2002.
4. **Godbole Operating System Concepts** –Achyut's

MICRO AND SMART SYSTEMS TECHNOLOGY

Subject Code	:	**06MS769**
IA Marks	:	

25

No. of Lecture Hrs./ Week

:

04

Exam Hours

:

03

Total No. of Lecture Hrs.

:

52

Exam Marks

:

100

PART - A

UNIT - 1

Introduction to micro and smart systems:

a) What are smart-material systems? Evolution of smart materials, structures and systems. Components of a smart system. Application areas. Commercial products.

b) What are microsystems? Feynman's vision. Micromachined transducers. Evolution of micro-manufacturing. Multi-disciplinary aspects. Applications areas. Commercial products.

5 Hours

UNIT - 2

Micro and smart devices and systems: principles and materials:

a) Definitions and salient features of sensors, actuators, and systems.

b) Sensors: silicon capacitive accelerometer, piezo-resistive pressure sensor, blood analyzer, conductometric gas sensor, fiber-optic gyroscope and surface-acoustic-wave based wireless strain sensor.

c) Actuators: silicon micro-mirror arrays, piezo-electric based inkjet print-head, electrostatic comb-drive and micromotor, magnetic micro relay, shape-memory-alloy based actuator, electro-thermal actuator

d) Systems: micro gas turbine, portable clinical analyzer, active noise control in a helicopter cabin

8 Hours

UNIT - 3

Micromanufacturing and material processing:

a) Silicon wafer processing, lithography, thin-film deposition, etching (wet and dry), wafer-bonding, and metallization.

b) Silicon micromachining: surface, bulk, moulding, bonding based process flows.

c) Thick-film processing:

d) Smart material processing:

e) Processing of other materials: ceramics, polymers and metals

f) Emerging trends

7 Hours

UNIT - 4

Modeling:

a) Scaling issues.

b) Elastic deformation and stress analysis of beams and plates. Residual stresses and stress gradients. Thermal loading. Heat transfer issues. Basic fluids issues.

c) Electrostatics. Coupled electromechanics. Electromagnetic actuation. Capillary electro-phoresis. Piezoresistive modeling. Piezoelectric modeling. Magnetostrictive actuators.

6 Hours

PART - B

UNIT - 5

Computer-aided simulation and design:

Background to the finite element element method. Coupled-domain simulations using Matlab. Commercial software.

8 Hours

UNIT - 6

Electronics, circuits and control:

Carrier concentrations, semiconductor diodes, transistors, MOSFET amplifiers, operational amplifiers. Basic Op-Amp circuits. Charge-measuring circuits. Examples from microsystems. Transfer function, state-space modeling, stability, PID controllers, and model order reduction. Examples from smart systems and micromachined accelerometer or a thermal cycler.

8 Hours

UNIT - 7

Integration and packaging of microelectro mechanical systems:

Integration of microelectronics and micro devices at wafer and chip levels. Microelectronic packaging: wire and ball bonding, flip-chip. Low-temperature-cofired-ceramic (LTCC) multi-chip-module technology. Microsystem packaging examples.

6 Hours

UNIT - 8

Case studies:

BEL pressure sensor, thermal cycler for DNA amplification, and active vibration control of a beam.

4 Hours

Part - C

UNIT - 9

Mini-projects and class-demonstrations (not for Examination)

9 Hours

a) CAD lab (coupled field simulation of electrostatic-elastic actuation with fluid effect)

b) BEL pressure sensor

c) Thermal-cycler for PCR

d) Active control of a cantilever beam

Text books and a CD-supplement:

1. A course-pack with matter taken from the following books including some newly written material. (This is until the textbook is ready. Chapter-wise resource material is indicated below.)
2. **MEMS & Microsystems: Design and Manufacture,** Tai-Ran Tsu, Tata Mc-Graw-Hill.

Reference books:

1. Animations of working principles, process flows and processing techniques, A CD-supplement with Matlab codes, photographs and movie clips of processing machinery and working devices.
2. **Laboratory hardware kits for** (i) BEL pressure sensor, (ii) thermal-cycler and (iii) active control of a cantilever beam.

1. **Microsystems Design,** S. D. Senturia, 2001, Kluwer Academic Publishers, Boston, USA. ISBN 0-7923-7246-8.
2. **Analysis and Design Principles of MEMS Devices,** Minhang Bao, Elsevier, Amsterdam, The Netherlands, ISBN 0-444-51616-6.

3. **Design and Development Methodologies,** Smart Material Systems and MEMS: V. Varadan, K. J. Vinoy, S. Gopalakrishnan, Wiley.

4. **MEMS-** Nitaigour Premchand Mahalik, TMH 2007

RELAY AND HIGH VOLTAGE LAB

Subject Code	:	**06EEL77**
IA Marks	:	25

No. of Practical Hrs./ Week	
:	
03	
Exam Hours	
:	
03	
Total No. of Practical Hrs.	
:	
42	
Exam Marks	
:	

50

(Total 10 experiments are to be conducted)

Part - A

(Choose at least two experiments)

1. Over current relay **:**

(a) IDMT non-directional characteristics

(b) Directional features

(c) IDMT directional

2. IDMT characteristics of over voltage or under voltage relay. .(solid stare or electromechanical type

3. (a) To determine 50% probability flashover voltage for air insulation subjected to impulse voltage.

(b) Generation of standard lightning impulse voltage and to determine efficiency and energy of impulse generator.

Operating characteristics of over voltage or under voltage relay. (Solid stare or electromechanical type).

4. Operation of negative sequence relay.

5. Bias characteristics of differential relay.

6. Current-time characteristics of fuse.

PART - B

(Choose at least one experiment)

1. Operating characteristics of microprocessor based (numeric) over –current relay.

2. Operating characteristics of microprocessor based (numeric) distance relay.

3 Operating characteristics of microprocessor based (numeric) over/under voltage relay.

PART - C

(Choose at least one experiment)

1. Generator protection –Merz-Price- protection scheme.

2. Feeder protection scheme-fault studies.

3. Motor protection scheme-fault studies.

PART - D

(Choose at least two experiments)

1. Spark over characteristics of air insulation subjected to high voltage AC with spark over voltage corrected to STP.

2 Spark over characteristics of air insulation subjected to high voltage AC, with spark over voltage corrected to STP for uniform and non-uniform field configuration.

3 Spark over characteristics of air insulation subjected to high voltage dc –

4 Measurement of HVAC and HVDC using standard spheres.

5 Breakdown strength of transformer oil using oil-testing unit.

6 Field mapping using electrolytic tank for any one-model cable/capacitor/transmission line/ Sphere gap models.

POWER SYSTEM SIMULATION LAB

Subject Code	**06EEL78**
IA Marks	25
No. of Practical Hrs./ Week	03
Exam Hours	

:

03

Total No. of Practical Hrs.

:

42

Exam Marks

:

50

Power system simulation using MATLAB/ C or C ++ Sie lab /octave

1. a) Y Bus formation for p systems with and without mutual coupling, by

singular transformation and inspection method.

b) Determination of bus currents, bus power and line flow for a specified system voltage (Bus) P
rofile

2. Formation of 2-bus, using 2-bus build Algorithm without mutual.

3. ABCD parameters: Formation for symmetric II/I configuration. Verification of AD-BC=1 Determination of coefficient and regulation

4. Determination of power angle diagrams for salient and non-salient pole synchronous m/c s, reluctance power, excitation, emf and regulation.

5. To determine I) Swing curve II) critical clearing time for a single m/c for connected to infinity bus through a pair of identical transmission lines, 3-phase fault on one of the lines for variation of inertia constant/line parameters /fault location/clearing time/pre-fault electrical output.

6. Formation of Jacobian for a system not exceeding 4 buses *(no PV buses) in polar coordinates

7. Write a program to perform load using Gaus- Seidel method (only p q bus)

8. To determine fault currents and voltages in a single transmission line systems with star-delta transformers at a specified location for SLGF, DLGF.

9. Load flow analysis using Gauss Siedel method, NR method, Fast decoupled flow method

for both pq and pv buses.

10. Optimal Generator Scheduling for Thermal power plants.

Note: 1,2,3,5,7… Simulation Experiments using MATLAB/C or C++/Sielab/Octave

4,6,9-use suitable Standard Package