SCHEME OF TEACHING AND EXAMINATION

B.E. ELECTRICAL & ELECTRONICS EINGINEERING

VI 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
06EE61

Power System

Analysis and Stability

E&EE

4

-

3

25

100

125

2

06EE62

Switchgear & Protection

E&EE
4
-
3
25
100
125
3
06EE63
Electrical Machine Design
E&EE

4

-

3

25

100

125

4

06EE64

Digital		Signal Processing

E&EE

4

-

3
25
100
125
5
06EE65
Electrical Drawing and CAD
E&EE
4
3

25
100
125
6
06EE66x
Elective-I (Group A)
E&EE
4
-
3
25
100

125

7

06EEL67

D.C. Machines and Synchronous

Machine Laboratory

E&EE

-

3

3

25

50

75
8
06EEL68
Control Systems Laboratory
E&EE
-
3
3
25
50
75

Total
24
06
24
200
700
900

Elective-I (Group A)

06EE661 - Network Synthesis and Active Filter Design 06EE665 - Object Oriented Programming using C++

06EE662 - Advanced Power Electronics 06EE666 - Fuzzy Logic

06EE663 - Electronic Instrumentation 06EE667 - Artificial Neural Network

06EE664 - Intellectual Property Rights

VI SEMESTER

POWER SYSTEM ANALYSIS AND STABILITY

Subject Code

:

06EE61	[illegible]

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

Representation of Power system Components: Circuit models of Transmission line, Synchronous machines, Transformer and load. One line diagram, impedance and reactance diagram. Per unit system, per unit impedance
Diagram of power system, Y-bus by inspection method
.

8 Hours

UNIT - 2

Symmetrical 3 - Phase faults: Transients on a transmission line, Short-Circuit currents and the reactance of synchronous machines on load and on no load.

6 Hours

UNIT - 3 & 4

Symmetrical components: Analysis of unbalanced load against balanced Three-phase supply, neutral shift, Resolution of unbalanced phasors into their symmetrical components, Phase shift of symmetrical components in star-delta transformer bank, Power in terms of symmetrical components, Analysis of balanced and unbalanced loads against unbalanced 3 phase supply
, Sequence impedances and networks of power system elements (alternator, transformer and transmission line) Sequence networks of power systems.

12 Hours

Part - B

UNIT - 5 & 6

Unsymmetrical faults: L-G, L-L, L-L-G faults on an unbalanced alternator with and without fault impedance. Unsymmetrical faults on a power system with and without fault impedance. Open conductor faults in power system.

14 Hours

UNIT - 7 & 8

Stability Studies: Steady state and transient stability. Rotor dynamics and the swing equation. Power angle equation for salient and non-salient pole machines, Equal area criterion for transient stability evaluation and its applications.

12 Hours

TEXT BOOKS:

1. **Elements of Power System Analysis**- W.D.Stevenson, -TMH,

2. **Modern Power System Analysis**-.I. J. Nagrath and D.P.Kothari- TMH, New Delhi

REFERENCE BOOKS:

1. **Power System Analysis**- Hadi Sadat- TMH

2. **Power system Analysis**- R.Bergen, and Vijay Vittal- Pearson publications, second edition.

3. **Computer Aided Power system analysis**- G.L., Kusic- PHI.

4. **Power System Analysis**- W.D.Stevenson & Grainger- TMH

SWITCHGEAR AND PROTECTION

Subject Code	:
06EE62	
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

Switches and fuses: Isolating switch, load breaking switch, Fuse law, cut -off characteristics,: Time current characteristics, fuse material, HRC fuse, liq uid fuse, Application of fuse

4 Hours

UNIT - 2

Principles of circuit breakers: Principles of AC Circuit breaking, Principles of DC Circuit

breaking, problems encountered in DC breaking, Initiation of arc, 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 - 3 & 4

Circuits Breakers: Air Circuit breakers – Air break and Air blast 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 - 5

Protective Relaying: Requirement of Protective Relaying, Zones of protection, primary and backup protection, Essential qualities of Protective Relaying, Classification of Protective Relays

4 Hours

UNIT - 6

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 - 7 & 8

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, ground fault, and abnormal operating conditions such as single phasing, phase reversal, over load

12 Hours

TEXT BOOKS:

1. **Switchgear & Protection**- Sunil S.Rao -Khanna Publishers.
2. **Power System Protection & Switchgear**- Badriram & Viswa Kharma -TMH.
3. **Fundamentals of Power System protection**- Y G. Painthankar and S R Bhide-PHI publication, 2007.

REFERENCE BOOKS:

1. **A Course in Electrical Power**- Soni, Gupta & Bhatnagar- Dhanapatirai. Publication -
2. **Power System Protection & Switchgear**- Ravindarnath & Chandra -New age Publications.
3. **Electrical Power-** Dr S. L. Uppal- Khanna Publishers.

ELECTRICAL MACHINE DESIGN

Subject Code	**06EE63**
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

Principles of electrical machine design: Introduction, considerations for the design of electrical machines, limitations. Different types of materials and insulators used in electrical machines.

4 Hours

UNIT - 2

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 pole, field windings – shunt, series and inter poles.

10 Hours

UNIT - 3 & 4

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, expression for leakage reactance and voltage regulation. Design of tank and cooling tubes (round and rectangular)

12 Hours

Part - B

UNIT - 5 & 6

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, estimation of No load current, leakage reactance, and circle diagram

14 Hours

UNIT - 7 & 8

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
2. **Design Of Electrical Machines**- V. N. Mittle- 4/e edition

REFERENCE BOOKS:

1. **Performance And Design Of AC Machine**s- M.G.Say

2. **Principles Of Electrical Machine Design-** R.K.Aggarwal

3. **Design Data Handbook-** Sanmug Sundarm

DIGITAL SIGNAL PROCESSING

Subject Code	:	06EE64
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

Discrete Fourier Transforms: Definitions, properties-linearity, shift, symmetry etc, circular convolution – periodic convolution, use of tabular arrays, circular arrays, stock hams's methods, linear convolution – two finite duration sequence, one finite & one infinite duration, overlap add and save methods .

12 Hours

UNIT - 3

Fast Fourier transforms algorithms: Introduction, decimation in time algorithm, first decomposition, number of computations, continuation of decomposition, number of multiplication, computational efficiency, decimation in frequency algorithms, decomposition for 'N