Department of Electrical & Electronics Engineering  
Scheme of Teaching and Examination  
B.E. (E&E) VI SEMESTER  
( For the academic year 2014-15 )

<table>
<thead>
<tr>
<th>Sl. No</th>
<th>Subject Code</th>
<th>Subjects</th>
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<th>Hours/ Week</th>
<th>Exam Marks</th>
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<td>UEE611C</td>
<td>Power System Analysis and Stability</td>
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<td>02</td>
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<td>03</td>
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<td>04</td>
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<td>05</td>
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**Total** 26 23 - 6 400 400 800

Elective – 3 (04 Credits)  
**UEE641E - Electrical Machine Design**  
**UEE642E – Advanced Power Electronics**

Elective – 4 (03 Credits)  
**UEE651E - Electrical Installation & Testing**  
**UEE652E – Embedded Systems**

- The SEE is conducted for 100 Marks and scaled down to 50 Marks.
POWERSYSTEMANALYSISANDSTABILITY

SubjectCode | SEE Marks | Credits | ExamDuration
---|---|---|---
UEE611C | 100 | 04 | 03 Hrs

Prerequisite

Unit - I

01 Power System Representation: 08 Hrs
Standard symbols of power system components, single line diagram, reactance and impedance diagrams, per unit quantity definition, per unit impedance of 3 phase component, change of base, equivalent load impedance of two winding transformer referred to primary and secondary, method to draw pu impedance diagram, advantages of pu system calculation, formation of Y- bus by inspection method.

02 Symmetrical 3-Phase Faults: 06 Hrs
3-phase short circuit at the terminals of unloaded generator, definitions of sub transient, transient and steady state reactance, transients on a transmission line, short circuit currents and the reactance of synchronous machines on load and no load, selection of circuit breaker rating-momentary current and interrupting capacity.

Unit - II

03 Symmetrical Components: 06 Hrs
Definition of sequence components, as applied to 3-Ph unbalanced Systems, operator “a” and its properties, expressions for sequence components, phase shift of symmetrical components in star delta transformer bank.

04 Sequence Networks: 06 Hrs
3-Ph power interms of sequence components, voltage drop due to sequence currents, sequence impedance and sequence networks of power system elements (Alternator, Transformer and Transmission line), positive, negative and zero sequence networks of power system elements.

Unit - III

05 Un Symmetrical Fault at the Terminals of Unloaded Generator: 08 Hrs
L-G, L-L, L-L-G fault with and without fault impedance at the terminals of unloaded generator-derivation for connection of sequence network.

06 Un Symmetrical Faults on Power Systems: 06 Hrs
Un symmetrical faults on unloaded power systems, examples on un symmetrical fault calculation for unloaded power systems, open conductor faults in power system.

Unit - IV

07 Stability Analysis Fundamentals: 06 Hrs
Steady state and transient stability rotor dynamics –M & H constants - definition and relation, swing equation and power angle equation and power angle curves for salient and non salient pole synchronous machines.

08 Equal Area Criterion: 06 Hrs
Equal area criterion – sudden change in mechanical input power, 3-ph fault on transmission line, expression for critical clearance angle.

TEXT BOOKS:


REFERENCES BOOKS:


Question Paper Pattern for SEE:

1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each Question should not have more than four sub divisions.
3. Any Five Full questions are to be answered choosing at least one from each unit.
MICROCONTROLLERS

Subject Code: UEE612C  
Prerequisite: 

Unit – I

01 Microprocessors and Microcontrollers:  
Introduction to 8085 microprocessors, microcontroller architecture of 8051: microcontroller hardware: block diagram, programming model, external memory, counters and timers, serial data input/output, interrupts. 

02 8051 Assembly Language Programming:  
Introduction to assembly language programming, assembling and running a program, The program counter and ROM space, data types and directives. 

03 Addressing Modes:  
Introduction, Addressing modes, External Data Moves, Code Memory Read Only Data Moves, Indexed Addressing Mode, PUSH and POP Opcodes, Data exchanges. 

Unit – II

04 Logical and Arithmetic Operations:  
Byte level and bit level logical operations, rotate and swap operations. Flags, incrementing and decrementing, addition, subtraction, multiplication and division, decimal arithmetic. 

05 Jump and Call Instructions:  
The jump and call program range, jumps, calls and subroutines interrupts and returns, more details on interrupts, example programs, machine cycle and time delays generation. 

Unit – III

06 8051 I/O and Timer Programming:  
I/O programming, I/O Bit Manipulation Programming. 
Timers, Counter programming, programming timers 0 and 1 in 8051 assembly. 

07 8051 Serial Port and Interrupt Programming:  
Basics of serial communication, 8051 connections to RS-232, serial port programming in 8051 assembly, Interrupts, Programming Timer Interrupts, Programming external Hardware Interrupts, Programming Serial Communication Interrupts, Interrupt programming in assembly. 

Unit - IV

08 8051 Interfacing and Applications:  
Interfacing 8051 to LCD, keyboard, parallel and serial ADC, DAC, Stepper motor interfacing, DC motor interfacing, Programming in 8051 Assembly. 

09 Microcontroller Application Development Tools:  
Programming in C for 8051: data types, time delays, I/O programming, Introduction to Integrated Development Environment (IDE), Hardware and software development tools. 

TEXT BOOKS:


REFERENCE BOOKS:

01 David Calcutt Fred Cowan, Hasan Parchizadeh Elsecier, “8051 Microcontrollers an application based introduction”, 

Question Paper Pattern for SEE: 
1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus. 
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GENERATION TRANSMISSION DISTRIBUTION & ESTIMATION

Subject Code: UEE613C
SEE Marks: 100
Credits: 04
Exam Duration: 03 Hrs

Prerequisite

Unit – I
01 Introduction to Power Generation: 08 Hrs
Non Renewable Energy Sources: Classification of Hydro(other than mini and micro), Thermal and Nuclear Power Generation in detail.

02 Renewable Energy Sources: 05 Hrs
Wind, Solar, Bio - fuel, Tidal, Wave & geothermal (Block diagram approach only).

Unit – II
03 Over Head Transmission Lines: 05 Hrs
Typical A.C. transmission system. Advantage of high voltage transmission. Sag calculation in conductors:
a) Suspended on level supports.
b) Supports at different level.
Effect of wind, ice tension & sag at erection. Stringing chart.

04 Performance of Transmission Lines: 08 Hrs
Short transmission lines, medium transmission lines, nominal end condenser method, T-method, Nominal π method and long transmission lines. ABCD constants of transmission lines.

Unit – III
05 Distribution: 05 Hrs
Radial and ring main systems, calculation for concentrated load and uniform loading.

06 Line Parameters: 08 Hrs
Inductance of a single phase two wire line. Inductance of three phase lines with equilateral and unsymmetrical space. Inductance of composite conductor lines. Capacitance of two wire line. Capacitance of three phase lines with equilateral and unsymmetrical spacing.

Unit – IV
07 Interior Wiring: 05 Hrs
Introduction, Choice of wiring systems, Different systems of wiring, Steps to carryout interior (residential) wiring estimation Earthing, Types of earthing, Definition of estimation, and Estimation for earthing and interior wiring (numericals).

08 Power Installations: 08 Hrs
Introduction: Code of practice, load calculation, wire size calculation, conduit and material selection for power installation, Steps to be followed to solve problems on power wiring, Estimation for wiring irrigation pump sets and theater.

TEXT BOOKS:

REFERENCE BOOKS:


Question Paper Pattern For SEE:
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MODERN CONTROL THEORY

Subject Code UEE614C
Credits 04
SEE Marks 100
Exam Duration 03 Hrs

Prerequisite

Unit - I

01 State Variable Analysis and Design:
Introduction, state space representation using physical variable, phase variable and canonical variables. 07 Hrs

02 Derivation of transfer function from state model:
Diagonalization, Eigen values, Eigen vectors, generalized eigen vectors. 06 Hrs

Unit – II

03 State Space Analysis:
Solution of state equation, state transition matrix and its properties, computation using Laplace transformation, power series method, Clay Hamilton method, concept of controllability and observability methods. 13 Hrs

Unit - III

04 Pole Placement Techniques:
Stability improvements by state feedback, necessary and sufficient condition for arbitrary pole placement, state regulator design and design of state observer. 07 Hrs

05 Controllers:
Introduction and Design of Proportional (P), Integral (I), Differential (D), PI, PD & PID. Compensators : Lead, Lag and Lag –Lead 06 Hrs

Unit – IV

06 Non-Linear Systems:
Introduction, behavior of non-linear system, common physical non linearity –saturation, friction, backlash, dead zone, relay, multivariable non-linearity. 02 Hrs

07 Phase plane method, singular points, stability of nonlinear system, limit cycles, construction of phase trajectories. 06 Hrs

08 Liapunov Stability Criteria: Liapunov function, direct method of Liapunov and the linear system, Hurwitz criterion and Liapunov’s direct method, construction of Liapunov functions for non linear system by Krasvskii’s method. 05 Hrs

TEXT BOOKS:

REFERENCE BOOK:

Question Paper Pattern for SEE:
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Elective – 3

ELECTRICAL MACHINE DESIGN

Subject Code: UEE641E

Credits: 04

Exam Duration: 03 Hrs

Prerequisite

Unit – I

01 Principles of Electrical Machine Design:
Introduction to design of electrical machines, limitations. Different types of materials and insulators used in electrical machines.

02 Design of DC Machines:
Output equation, choice of specific loadings and number of poles, design of main dimensions, armature slot dimensions, commutators, brushes, and magnetic circuit – estimation of ampere turns, yoke, pole and field windings (shunt, series and inter poles).

Unit – II

03 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. Design of tank and cooling tube.

Unit – III

04 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, relation between bar and end ring currents. Estimation of no load current, leakage reactance.

Unit – IV

05 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 machine. Design of rotor of salient pole synchronous machines, magnetic circuits, dimensions of the pole body, field winding, and rotor of non salient pole machine.

TEXT BOOKS:


REFERENCE BOOKS:

02 M.G. Say, “Performance And Design of AC Machines”, Issac pitman, London 1980

Question Paper Pattern for SEE:

1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each Question should not have more than four sub divisions.
3. Any Five Full questions are to be answered choosing at least one from each unit.
(Elective-3)
ADVANCED POWER ELECTRONICS

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<td>Credits</td>
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<td>Exam Duration</td>
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Prerequisite

**Unit – I**

01 **Introduction to Power Electronics:**
Introduction, Applications, switching characteristics of Thyristor, MOSFET, IGBT, GTO, IGCT, MCT.

02 **Controlled Rectifiers:**
Three-phase Half wave and Full wave rectifiers with RL, RLE loads

**Unit – II**

03 **Inverters:**

04 **Multilevel Inverters:**
Introduction, concept of multilevel inverter, flying capacitor, diode clamp and cascaded H-bridge and Applications.

**Unit – III**

05 **Power Supply:**
Introduction, Design of linear power supply, forward and fly back (waveform and design), H-bridge, Full bridge

06 **Resonant Converters:**
Introduction, Series, Parallel, ZVS & ZCS, Advantages and applications.

**Unit – IV**

07 **Power Electronics Application:**
Power Electronic for Wind Power system: Basics of Wind power, Types of Wind power system, Wind-Diesel Hybrid system, grid connected Wind Energy System, Control of Wind Turbine

08 **Drives:**
Drive requirement, Classification and characteristics, load profiles and characteristics, variable speed drive topologies, PWM VSI Drive, and applications.

**TEXT BOOKS:**

**REFERENCES:**

**Question Paper Pattern for SEE:**
1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each Question should not have more than four sub divisions.
3. Any Five Full questions are to be answered choosing at least one from each unit.
ELECTRICAL ESTIMATION AND TESTING

Subject Code : UEE651E
Credits : 03
Exam Duration : 03 Hrs

Prerequisite

Unit–I

01 Economic aspects of power generation: 13Hrs

Unit–II

02 Economics of power factor improvement: 06Hrs

03 Tariffs: 07Hrs

Unit–III

04 Depreciation: 06Hrs
Introduction: Types of depreciation:- physical and functional, methods of calculating depreciation:- Straight line, reducing balance, sinking fund, sum of years digit, insurance policy, machine hours basis, production unit, annuity charging and revaluation methods. Inventory control, Economic order quantity and break even analysis:- Assumptions, breakeven chart, breakeven point, margin of safety, profit volume ratio and target sales volume. Uses and limitation breakeven analysis.

05 Choice of plants and economic selection: 07Hrs

Unit–IV

06 Wiring: 06Hrs
Introduction, Choice of wiring systems, Different systems of wiring, necessity of earthing, discuss the normal earthing and earthing in power station, Definition of estimation, steps to carryout interior (including multi storied buildings) wiring estimation. Estimation for earthing and interior(including multi storied buildings) wiring.

07 Power Installations: 07Hrs
Introduction: Code of practice, load calculation, wire size calculation, conduit and material selection for power installation, steps to be followed to solve problems on power wiring, Estimation for wiring irrigation pump sets and theater. Discuss installation of transformers and induction machines.

Text Books:


Reference Books:


QUESTION PAPER PATTERN FOR SEE:
1. Total of Eight Questions with two from each unit to be set uniformly covering the entire syllabus.
2. Each Question should not have more than four sub divisions.
3. Any Five Full questions are to be answered choosing at least one from each unit.
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<tr>
<td>Exam Duration</td>
<td>:03 Hrs</td>
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Prerequisite

01 Generation of Unit step, ramp, exponential, and sinusoidal signals
02 Convolution of two signals
03 To determine power and energy of the signals
04 To determine impulse response given y(n) and x(n)
05 To determine DTFT of given sequence
06 Circular convolution of two given sequences
07 Auto correction of a given sequence and verification of its properties
08 Cross correlation of given sequences and verification of its properties
09 Computation of N – point DFT of a given sequence and to plot magnitude and phase
10 Linear convolution of two sequence using DFT & IDFT
11 Circular convolution of two sequences using DFT & IDFT
12 Design and implementation of FIR fitter to meet given specifications.
13 Design and implementation of IIR fitter to meet given specifications.
14 Study of DSP starter kits (DSK)
15 Linear convolution Using DSK
16 Circular Convolution using DSK
17 Computation of N point DFT using DSK

Laboratory Assessments:

1) Each Laboratory is evaluated for 100 marks (50 CIE and 50 SEE).
2) Allocation of 50 marks for CIE
   - Performance and journal write-up: Marks for each experiment = 30 marks.
   - One Practical test for 20 marks (5 write up, 10 conduction, calculation, Results etc., 5 viva-voce).
3) Allocation of 50 marks for SEE. 25% write-up, 50% conduction, calculation, results etc., 25% viva-voce.
MICROCONTROLLERS LAB

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Prerequisite

**Programming in Assembly Language:**

01 Data transfer – Block move, exchange, sorting, finding largest element in an array.
02 Arithmetic Instructions- Addition/Subtraction, Multiplication and division, Square, Cube – (16 bits arithmetic operations – bit addressable).
03 Counters.
04 Boolean & logical Instructions (Bit manipulations)
05 Conditional call and return.
07 Programs to generate delay, programs using serial port and on chip timer / counter.

**Interfacing (Programming using Assembly/C):**

01 Simple calculator using 6 digit 7 segment display and Hex key board interface to 8051.
02 Alpha numeric LCD panel and Hex key board input interface
03 External ADC and temperature control interface
04 Wave form generation: Sine, square, triangular, ramp etc. using DAC interface
05 Stepper motor and DC motor control interface/
06 Elevator interface.

**Laboratory Assessments:**

1) Each Laboratory is evaluated for 100 marks (50 CIE and 50 SEE).
2) Allocation of 50 marks for CIE
   - Performance and journal write-up: Marks for each experiment = 30 marks.
   - One Practical test for 20 marks (5 write up, 10 conduction, calculation, Results etc., 5 viva-voce).
3) Allocation of 50 marks for SEE. 25% write-up, 50% conduction, calculation, results etc., 25% viva-voce.