## BACHELOR OF ENGINEERING (ELECTRICAL & ELECTRONICS) VI SEMESTER

<table>
<thead>
<tr>
<th>Ref No.</th>
<th>Subject</th>
<th>SCHEDULE OF TEACHING</th>
<th>SCHEME OF EXAMINATION</th>
<th>THEORY</th>
<th>PRACTICAL</th>
<th>Credits</th>
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<td>EE-601</td>
<td>Computer Aided Power System Analysis</td>
<td>3</td>
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<td>EE-602</td>
<td>Microcontrollers, PLCs and Applications</td>
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<td>EE-604</td>
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<td>Computer Networks</td>
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<td>Power Electronics and Drives</td>
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**Note:**

*marks refer to mid semester evaluation and end semester evaluation.
Course Title | Computer Aided Power Systems Analysis | Credits | 04
---|---|---|---
Course Code | EE-601 | L T P | 3 1 0
Contact Hours | 45 | Max Marks-50 | Internal Assessment-50 | Elective | N
Pre-requisites | Knowledge of Power System-I and Synchronous Machines |
Course Objectives
1. To learn about the power system analysis using power flow.
2. To understand the importance of per unit system in power system.
3. To be competent in understanding power system stability.
4. To learn about various types of faults and their analysis.

Course Outcome (s)
1. Students will be confident in solving power system load flow problems in real life.
2. Students will be able to analyze and design a power system.
3. Students will be competent to analyze power system under various fault conditions maybe symmetrical or unsymmetrical.
4. Students can simulate and analyze the existing power system under various load conditions.

Note for Examiner- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART-A

1. **Per Unit System**
   Introduction to per unit system, per unit impedances in single phase transformer circuits, three phase transformers, three winding transformers, advantages of per unit system, Introduction to Per unit system.
   (5-hours)

2. **Power Flow Studies**
   (7-hours)

3. **Power System Controls**
   Generator-Voltage Control, Turbine-Governor Control, Load-Frequency Control (single area and two area case), Economic Dispatch, Introduction to Optimal Power Flow.
   (6-hours)

4. **Transient Stability Studies**
   Introduction of power system stability, The Swing Equation, Simplified Synchronous Machine Model and System Equivalents, Stead state stability, Transient stability, The Equal-Area Criterion for sudden change in mechanical input, sudden loss of one parallel lines, sudden short circuit on one parallel lines and effect of clearing time on
stability, Numerical Integration of the Swing Equation, Design Methods for Improving Transient Stability. 

(8-hours)

PART B

5. **Symmetrical Faults**

(6-hours)

6. **Symmetrical Components**
   Definition of Symmetrical Components, Sequence Networks of Impedance Loads, Sequence Networks of Series Impedances, Sequence Networks of Three-Phase Lines, Sequence Networks of Rotating Machines, Per-Unit Sequence Models of Three-Phase Two-Winding Transformers, Per-Unit Sequence Models of Three-Phase Three-Winding Transformers, Power in Sequence Networks

(6-hours)

7. **Unsymmetrical Faults**

(6-hours)

**TEXT BOOKS RECOMMENDED**


**OTHER RECOMMENDED BOOKS**

<table>
<thead>
<tr>
<th>Course Title</th>
<th>Computer Aided Power Systems Analysis Laboratory</th>
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<tbody>
<tr>
<td>Credits</td>
<td>02</td>
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<tr>
<td>Course Code</td>
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<td>Max Marks</td>
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<td>P</td>
<td>03</td>
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Note: At least five design / analysis projects relating to Sr. No 4-10 can be performed while Sr. No. 1-3 are compulsory.

1. Introduction to MATLAB Software
2. Formulation of $Y_{bus}$ using MATLAB Software
3. Formulation of $Z_{bus}$ for a system using step-step algorithm using MATLAB Software
4. Symmetrical Fault analysis
5. Unsymmetrical Fault analysis
6. Power flow analysis.
7. Power flow control
8. Economic dispatch
10. Load frequency control
Course Title: Microcontroller, PLCs and Applications  
Credits: 04

Course Code: EE-602  
L T P: 3 1 0

Contact Hours: 45  
Max Marks: 50  
Internal Assessment: 50

Elective: N

Pre-requisites: Knowledge of Microprocessor and Digital Electronics

Course Objectives:
1. To study comparison of microprocessor and microcontroller.
2. To study basic features of 8051 microcontroller.
3. To study assembly language programming.
4. To study real world interfacing with 8051.
5. To study basics of PLC and programming for PLC.

Course Outcome:
1. To study basics of PLC and programming for PLC.
2. To study comparison of microprocessor and microcontroller.
3. To study basic features of 8051 microcontroller.
4. To study assembly language programming.
5. To study real world interfacing with 8051.

Note for Examiner: Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

PART-A

1. Introduction
   Microcontroller, Comparison of Microprocessor and Microcontroller, microcontroller and embedded processors.  
   (6 hours)

2. The 8051 Architecture
   8051 Microcontroller hardware, Input/Output Pins, Ports, and Circuits, External memory, Counter & timers, Serial Data Input/Output, Interrupts.  
   (6 hours)

3. 8051 Assembly Language Programming
   Introduction to 8051 Assembly programming, Assembling and running an 8051 program. Data Types and directives. Addressing modes and accessing memory using various addressing modes. Arithmetic instructions and programs, Logic instructions and programs, Single bit instructions and programming, Jump loop and call instructions, I/O Port programming, Timer/counter programming in the 8051.  
   (6 hours)

4. Serial Communication
   8051 connection to RS 232, 8051 serial communication Programming.  
   (6 hours)
PART B

5. Real World Interfacing
   LCD, ADC and sensors, Stepper motor, keyboard, DAC and external memory
   (6 hours)

6. Ladder Diagram Fundamentals
   Basic Components and their symbols, Fundamentals of Ladder Diagrams, Machine
   Control Terminology
   (6 hours)

7. Introduction to PLC
   Brief History, PLC configurations, System Block Diagram, Update - solve the ladder-
   update
   (6 hours)

8. Fundamental PLC programming
   Introduction, Physical components, Program Components, Internal Relays,
   Disagreement Circuit, Majority Circuit, Oscillator, Holding Contacts, Always on and
   always off contacts, Ladder Diagrams having more than one rung.
   (6 hours)

9. Mnemonic Programming Code
   AND Ladder Rung, Entering Normally closed contacts, OR Ladder Rung, Simple
   Branches, Complex Branches.
   (6 hours)

TEXT BOOKS

2. John Hackworth & Frederick Hackworth, Programmable Logic Controllers

OTHER RECOMMENDED BOOKS

1. Ayala, The 8051 Microcontroller Architecture, Programming & application
2. John W. Webb, Programmable logic controllers Principles & applications, Prentice
Course Title: Micro Controller, PLCs and Applications (Lab)  
Credits: 02  
Course Code: EE-652  
Max Marks: 50  
P: 03

Note: At least eight experiments to be done selecting at least two from the last experiment.

1. Study of 8051/8031 Micro controller kits.
2. Write a program to add two numbers lying at two memory locations and display the result.
3. Write a program for multiplication of two numbers lying at memory location and display the result.
4. Write a program to check a number for being ODD or EVEN and show the result on display.
5. Write a program to split a byte in two nibbles and show the two nibbles on display.
6. Write a Program to arrange 10 numbers stored in memory location in Ascending and Descending order.
7. Write a program to find a factorial of a given number.
8. Write a program of Flashing LED connected to port 1 of the Micro Controller
9. Write a program to generate a Ramp waveform using DAC with micro controller.
10. Write a program to interface the ADC.
11. Write a program to control a stepper motor in direction, speed and number of steps.

Write Ladder programs (at least two) using PLC for control of simple industrial Processes.
<table>
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<th>Course Title</th>
<th>Electronics Systems Design</th>
<th>Credits</th>
<th>04</th>
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<td>Course Code</td>
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<td>3 1 0</td>
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<td>Contact Hours</td>
<td>45 Max Marks-50 Internal Assessment-50 Elective</td>
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<td>Pre-requisites</td>
<td>Knowledge of digital circuits, karnaugh maps, Fundamentals of Combinational and Sequential circuits</td>
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</table>
| Course Objectives    | 1. To inculcate understanding of designing of electronic circuits.  
|                      | 2. To understand the concept of minimization of switching expressions. |
| Course Outcome       | 1. Students will be able to apply the knowledge and understanding gained through the course to the practical projects  
|                      | 2. Students will be able to design any electronic circuit with minimum Components |

**Note for Examiner**- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

**PART-A**

1. **Combinational Circuits**
   Error Correction and Detection: Error detection and correction techniques, Single error detection, Single error correction with double error.  
   Fault detection and Location in combinational circuits: Different methods of detecting and locating Faults in combinational circuits.  
   (20-hours)

**PART-B**

2. **Sequential Circuits**
   Synchronous circuits: Concept of state diagram and state table, state assignment, state reduction, Analysis and synthesis of sequential circuits.

(25-hours)

TEXT BOOKS
1. Digital circuits and Logic Design By Lee, PHI.
2. Switching and Finite Automata Theory by Kohavi, TMH.

OTHER RECOMMENDED BOOKS
1. Computer Logic Design, Morris Mano, PHI.
2. Switching circuits for Engineers, Marcus, PHI.
3. Introduction to Digital systems, James Palmier, David Perlman.
<table>
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<th>Electronic Systems Design Lab</th>
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<tr>
<td>Course Code</td>
<td>EE- 654</td>
<td>Max Marks-50</td>
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**Note:** At least eight experiments are to be performed.

1. Design of an Instrumentation Amplifier.
2. Design of an AC/DC voltage regulator using SCR.
3. Design of process control timer.
4. Design of wireless data modem.
5. Microcontroller based systems design.
6. Design of AM modulator and demodulator.
7. Design of FM modulator and demodulator.
8. Design a sequence detector to detect a given sequence.
9. Arithmetic logic unit design.
10. DSP based system design.
**Course Title**: Computer Networks  
**Credits**: 04

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<td><strong>Pre-requisites</strong></td>
<td>Knowledge of Multiplexing and Bridges</td>
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</table>

**Course Objectives**
1. To study basic concepts of Computer Networks used in business, home and mobile communication.  
2. To study basic models used for internetwork and intranet work.  
3. To study different layers of reference models used for networking.  
4. To study protocols, standards and flow control at different layers.  
5. To study applications of computer networks in daily life.

**Course Outcome(s)**
1. To learn the concepts of switching, modulation, LAN, WAN and MAN.  
2. To learn OSI and TCP/IP model and their comparisons.  
3. To learn physical, data link, network and application layers in detail.  
4. To learn protocols like TCP, UDP, HTTP, FTP, etc.  
5. To learn about Electronic Mail, World Wide Web and Multimedia.

**Note for Examiner**- Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

**PART-A**

1. **Introduction**  
   Data Transmission concepts; switching; Modulation; multiplexing; Network Hardware: LAN, MAN, WAN, Wireless Networks, Internet works; Network Software: Layer, Protocols, interfaces and services; Reference Model: OSI, TCP/IP and their comparison.  
   (6-hours)

2. **Physical Layer**  
   (6-hours)

3. **Data Link Layer**  
   Framing; Error control; Error Correction & Error Detection; Sliding window protocols; Examples of DLL Protocols – HDLC, SLIP, PPP ; Medium Access Sub Layer: Channel Allocation, MAC protocols – ALOHA, CSMA protocols, Collision free protocols, Limited Contention Protocols, Wireless Protocols, IEEE 802.3, 802.4, 802.5 standards and their comparison. Bridges: Transparent, source routing, remote.
PART-B

4. **Network Layer**
   Design issues, routing algorithms (shortest path, flooding, flow based, distance vector, hierarchical, broadcast, multicast, for mobile host). Introduction to Congestion control algorithms.

5. **Transport Layer**
   Addressing, establishing and releasing connection, flow control & buffering, multiplexing, crash recovery, Internet Transport protocol (TCP and UDP).

6. **Application Layer**
   Basics of Network security, Domain Name System, Introduction of Simple Network Management Protocol, Electronic mail and FTP.

**TEXT BOOKS**
1. Computer Network Andrew S. TanenBaum (PHI)
2. Data Communications and Networking, 3/e Behrouz A Forouzan (Mcgraw-hill)

**OTHER RECOMMENDED BOOKS**
1. Data and Communication William Stallings (PHI)
2. Data & Computer Communication Douglos E. Coomer (Addison Wessl)


<table>
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<th>Course Title</th>
<th>Power Electronics &amp; Drives</th>
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<td>Basic of Semiconductor Electronics and Power Electronics Converters.</td>
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**Course Objectives**

1. To provide the electrical circuit concepts behind the different working modes of inverters so as to enable deep understanding of their operation.
2. To equip with required skills to derive the criteria for the design of power converters for UPS, Drives etc.,
3. Ability to analyse and comprehend the various operating modes of different configurations of power converters.

**Course Outcome**

1. To be able to design different single phase and three phase AC converters.
2. To be able to select and design appropriate power drive circuits for various machines control applications.

**Note for Examiner** - Examiner will set 7 questions of equal marks. First question will cover whole syllabus, having 10 conceptual questions of 1 mark each and is compulsory. Rest of the paper will be divided into two parts having three questions each and the candidate is required to attempt at least two questions from each part.

**PART-A**

1. **AC Voltage Controllers**
   ON-OFF control – phase control – 1-phase full wave – analysis with R & RL load – input PF, two stage sequence control with R & RL load – 3-phase full-wave controller with R load, 3-phase bidirectional delta connected controllers
   
   (8 hours)

2. **Inverters**
   1-phase half bridge and full bridge – HF, THD, DF, 3-phase inverter - 180º and 120º conduction, Analysis with R & RL load, PWM techniques – single pulse, multiple pulse & sinusoidal pulse width modulation, modulation index, voltage control of 3-phase inverters, sine PWM, harmonic reduction, bipolar & unipolar modulation, current source inverter, Series and parallel inverters, Mc-Murray Bedford inverters.
   
   (12 hours)

3. **Multi Level Inverters**
   Multilevel concept – diode clamped – flying capacitor – cascade type multilevel inverters
   
   (5 hours)
PART-B

4. **Cycloconverters**
   Principle of operation, Single phase and Three-phase Dual converters, Single phase and three phase cyclo-converters, power factor Control, Introduction to matrix converters, Advantages disadvantages of cycloconverter  
   (08 hours)

5. **Electric Drives**
   (12 hours)

**TEXT BOOKS RECOMMENDED**


**OTHER RECOMMENDED BOOKS**

Note: At least eight experiments are to be performed selecting at least three from experiment 7.

2. Speed control of induction motor using thyristor.
4. Study of mc murray half-bridge inverters and check their performance
5. Study of the microprocessor based firing control of a bridge converter.
6. To design and simulate the ac controller and analyze the results
7. Design and simulation of following thyristor circuits using pscad / matlab software.
   a) Inverter circuits
   b) Dc-dc drive
   c) Dc-ac drive