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

<table>
<thead>
<tr>
<th>Ref No.</th>
<th>Subject</th>
<th>SCHEDULE OF TEACHING</th>
<th>SCHEME OF EXAMINATION</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>L</td>
<td>T</td>
</tr>
<tr>
<td>EE501</td>
<td>Power Systems-II</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>EE551</td>
<td>Power Systems-II Lab</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EE502</td>
<td>Power Electronics and Drives</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>EE552</td>
<td>Power Electronics and Drives Lab</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EE503</td>
<td>Microprocessors and Interfacing</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>EE553</td>
<td>Microprocessors and Interfacing Lab</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EE504</td>
<td>Instrumentation Systems</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>EE554</td>
<td>Instrumentation Systems Lab.</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EE505</td>
<td>Neural Networks and Fuzzy Logic</td>
<td>3</td>
<td>1</td>
</tr>
<tr>
<td>EE555</td>
<td>Neural Networks and Fuzzy Logic Lab</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>EE556</td>
<td>Vocational Training after Fourth Semester</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

**Total** | **15** | **5** | **15** | **35** | **250** | **250** | **500** | **300** | **29**

*Note:*
*marks refer to mid semester evaluation and end semester evaluation.*
EE- 501
Power Systems-II

External: 50
Sessional: 50
Credits : 4
L T P 3 1 0

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

1. Power System Protection


Power System Overvoltages, protection against over voltages by shielding or ground wires and lightning arrestors, insulation coordination. (13h)

2. Circuit Breakers

Transient recovery voltage, resistance switching, first pole to clear factor, Transient recovery voltage, arc and arc extinction, volt ampere characteristics of arc, methods of arc extinction, construction, working and applications of air-break circuit breakers, oil circuit breakers, vacuum circuit breakers, air blast circuit breakers, SF6 circuit breakers, circuit breaker ratings. (10 h)

PART-B

3. Substations and Distribution

Location and types of substations, bus-bar arrangements, major substation equipment

Types of insulators, voltage distribution across suspension insulators, string efficiency, methods of improving string efficiency.

Types of Underground cables, capacitance of single core cables, grading of cables, capacitance of three core belted cables, power factor and heating of cables, Radial, parallel or loop, network or grid types of distribution systems and their relative merit. (10 h)

4. Grounding

Grounding fundamentals, Ground resistance, step voltage, touch voltage and transferred voltage, tolerable step and touch voltages, ground resistance of a hemisphere and driven rod, IEEE Standard 80 formulae for ground resistance and step and mesh voltages of a grounding grids, limitations of the formulae.

Neutral grounding: ungrounded systems, resonant grounding, solid or effective grounding, reactance grounding, earthing transformer, neutral grounding practice. (8 h)
Text Book / Standards

Other Recommended Books
Note: At least eight experiments / projects / technical reports relating to the following:
1. Measurement of soil resistivity and soil model evaluation
3. Grounding system design for a substation.
4. To study the characteristics of over current relay.
5. To study the characteristics of percentage differential relay.
6. To study the characteristics of distance relay.
7. To study current time characteristics of fuses.
8. Technical visit to a substation/generating station, Load Dispatch Centre and preparation of a technical report for the same
9. Conventional and renewable energy sources
10. Distribution system design
11. Digital relaying
12. Reactive compensation of lines
EE- 502  
POWER ELECTRONICS AND DRIVES

External: 50  
Sessional: 50  
Credits : 4  

L T P 3 1 0

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Thyristor and Semiconductor Power Switching Devices  (12)
Devices of Thyristor family and their V-I characteristics: Thyristor, Diac, Triac, GTO, MOSFET, IGBT, Principle of operation of SCR, two transistor model of SCR. Turn on methods of a Thyristor, Switching characteristics of Thyristor during turn-on and turn-off, Gate characteristics, Thyristor triggering and commutation circuits
Series and parallel operation of SCR’s, Thyristor specifications (latching current and holding current, dv/dt and di/dt etc.), Thyristor Protection circuits, UJT: characteristics and as a relaxation oscillator.

Phase controlled Rectifiers  (5)

Part-B

Choppers  (5)
Principle of chopper operations, Control strategies, types of chopper (A, B, C, D, and E), and voltage commutated, current commutated chopper, Jones chopper, Morgan chopper.

Inverters  (5)

Cycloconverters  (3)
Single phase bridge cycloconverter. Three phase to single phase, single phase to single phase cycloconverter. Advantages disadvantages of cycloconverter.

D C and A C Drives  (6)
Text Books

- Mohammed H. Rashid, power Electronics- circuits, Devices and applications, PHI New Delhi, 2001

Other Recommended Books

- Vedam Subrahmanyam, “Thyristor Control of Electric Drives”, New Delhi,1998
EE –552
POWER ELECTRONICS AND DRIVES LAB

Marks: 50
Credits : 2
L T P 0 0 3

Note: At least eight experiments are to be performed.

1. To plot the V-I characteristics of the SCR.
2. To draw V-I characteristics of Triac.
3. Study of SCR triggering circuits and check the performance of UJT as triggering device.
4. Study of SCR commutation circuits and check the performance of one commutation circuit.
5. Study of Jones chopper or any chopper circuit to check the performance.
7. Speed Control of induction motor using Thyristor.
8. Study of series inverter and Mc Murray half-bridge inverter and check their performance.
10. Design and simulation of following Thyristor circuits using PSCAD / MATLAB software.
   i. commutation,
   ii. chopper,
   iii. invertors,
   iv. rectifier
   v. UJT as triggering circuit
   vi. Speed control of motors.
EE- 503
Microprocessors and Interfacing

External: 50  
Sessional: 50  
Credits : 4  

L T P 3 1 0

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

Part-A

Microprocessor Architecture and Microcomputer Systems; Microprocessor Architecture & Operations, Memory, Input and Output Devices, The 8085 MPU, Example of an 8085-Based Microcomputer, Memory Interfacing. (6 h)

Programming the 8085: Introduction to 8085 Assembly Language Programming, The 8085 Programming Model, Instruction Classification, Instruction Format, Data Transfer (Copy) Operations, Arithmetic Operations, Logic Operations, Branch Operations, Writing Assembly Language Programs. (5 h)

Programming Techniques: Looping, Counting and Indexing, Additional Data Transfer and 16-Bit Arithmetic Instructions, Arithmetic Operations Related to Memory, Logic Operations. (4 h)

Counters and Time Delays: Counters and Time Delays, Hexadecimal Counter, Modulo Ten Counter, Generating Pulse Waveforms (4 h)
Stack and Subroutines: Stack, Subroutine, Restart, Conditional Call and Return Instructions. (2 h)

Part –B

Interrupts : The 8085 Interrupt, 8085 Vectored interrupts. (4 h)

Interfacing I/O Devices: Basic Interfacing Concepts, Interfacing Output Displays, Interfacing Input Devices, Memory- Mapped I/O (2 h)

Interfacing Data Converters: Digital- to- Analog (D/A) Converters, Analog- to- Digital (A/D) Converters (4 h)

General –Purpose Programmable Peripheral Devices: The 8255A Programmable Peripheral Interface- I/O Mode and BSR Mode (3 h)

Serial communication: Basic communication concepts in serial I/O, RS232C (2 h)

8086 Microprocessor : 8086 CPU Architecture, Segmented memory, Addressing modes (4 h)
TEXT BOOKS

- Ramesh S. Gaonkar, “Microprocessor Architecture, Programming and Applications with the 8085”
- John Uffenbeck, The 8086/8088 family Design, Programming & Applications

OTHER RECOMMENDED BOOKS:

- Charles M. Gilmore, “Microprocessor Principles and Applications”, TMH.
- Douglas V. Hall, “Microprocessors and Interfacing programming and Hardware” TMH.
EE-553
MICROPROCESSORS AND INTERFACING LAB

Marks: 50
Credits: 2

Note: Attempt any ten programs..

1. Study of 8085 Microprocessor kit
2. Write Assembly Language Program to add n given numbers with and without carry.
3. Write Assembly Language Program to count positive & negative numbers in given n numbers.
4. Write Assembly Language Program to de-assemble 8-bit number in two nibbles.
5. Write Assembly Language Program to reassemble two nibbles in 8-bit number.
6. Write Assembly Language Program to sort given n numbers in ascending & descending order using subroutine.
7. Write Assembly Language Program to relocate the given numbers in same & reverse order.
8. Write Assembly Language Program to Flash different letters using your own delay subroutine.

Interfacing of Microprocessor 8085:

1. To obtain a square wave on CRO
2. To interface A to D converter
3. To interface D to A converter
4. To interface stepper motor with µp to control its step size and direction of rotation
5. To develop a traffic light controller program and interface using Input/Output Module.
**EE- 504**  
**Instrumentation Systems**

External: 50  
Sessional: 50  
Credits : 4  

L T P: 3 1 0

**Note:** Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

**PART-A**

1) **Transducers & Standards**  
Standards of Instrumentation Systems and Their Classification: Emf, Current, Resistance and Capacitance Standards. Sensors and Transducers: Primary Sensing Elements; Characteristics; Classification.

Passive-Transducers-Resistive, Inductive, Capacitive; Types, Features, Configurations, Analysis, Applications.

Active Transducers- Thermoelectric, Electromagnetic, Piezo-Electric, Photoelectric; Types-Principle, Construction, Analysis and Applications.

2) **Digital - Analog Instruments and Recording Systems**


**PART-B**

3) **Signal Conditioning:**  
Analog Conditioning- Instrumentation and Logarithmic Amplifiers.


Types-Analog/Digital, Block Diagram, Operation, Comparative Performance

Data Display and Recording Devices: Principle, Operation and Use of -LEDs, LCDs, Recorders-Paper Chart, Magnetic Tape, Semi-Conductor;

4) **Virtual Instrumentation**

Introduction to lab VIEW Front Panel, Block Diagram, Tools And Palettes, Menus, Code Debugging, Creating Sub-Vis, For Loop, While Loop, Structures, Arrays And Clusters, Graphs And Charts, File Input And Output , Data acquisition and applications.

**TEXT-BOOK**

1. W.D. Cooper and A.D. Hilfrick: Electronic Instrumentation & Measurement Techniques, PHI.

2. A.K Sahnwey “Electronic and Electrical Instrumentation”.

3. R.H.Bishop, Learning with LabVIEW 7 Express,Pearson Education, Delhi.

**References:**

1. Murthy, D.V.S. - Transducers Instrumentation
Note: At least eight experiments are to be performed.

1) Displacement measurement using LVDT
2) To study the operation of Instrumentation Amplifier.
3) Measurement of flow using electromagnetic and positive displacement parameters.
4) Measurement of level using capacitance probe differential pressure transducer.
5) Design of linearization circuit for thermistor.
6) Experiments based on Lab VIEW.
EE-505
Neural Networks and Fuzzy Logic

External: 50                      L T P
Sessional: 50                   3 1 0
Credits : 4

Note: Examiner shall set eight questions, four from Part-A and four from Part-B of the syllabus. Candidate will be required to attempt any five questions selecting at least two questions from Part A and two from Part B.

PART-A

Fundamentals of Neural Networks
Classical Artificial Intelligence and Neural Networks, characteristics of neural networks, biological inspiration, models of artificial neuron, History of development, activation functions, neural networks architectures (5)

Learning
Types of learning: Supervised, unsupervised and reinforcement learning, Basic Hopfield Model, the perceptron, linear separability, Basic learning rules: error correction, memory based, Hebb’s rule, competitive, Boltzmann, Backpropagation training algorithm, Applications of Backpropogation. (7)

Associative Memory Networks
Introduction, auto-associative, hetero-associative, Bidirectional associative memories (BAM), Hopfield networks. (6)

PART-B

Unsupervised Learning Networks
Architectures & algorithms: Maxnet, Maxican Hat Net, Kohonen Self-organizing Feature Map (SOFM), ART1 & ART2 networks, Applications. (7)

Fuzzy Logic
Basic concepts of Fuzzy Logic, Fuzzy vs Crisp set, Fuzzy uncertainty & Linguistic variables, membership functions, operations on fuzzy sets, fuzzy relations, fuzzy rule base and approximate reasoning, variable inference techniques, defuzzification techniques, Fuzzy system design, Applications of fuzzy logic. (8)

Introduction to Adaptive Neuro Fuzzy Inference System (ANFIS), its characteristics and applications. (3)

Books Recommended:
2. Neural Networks – A Comprehensive Foundation by Simon Haykin, Pearson
Education.

3. Neural Networks, fuzzy Logic, and Genetic Algorithms by Rajasekaran & Vijayalakshmi Pai, PHI.

4. Neural Networks – A Classroom Approach by Satish Kumar, TMH.

5. Fuzzy Logic with engineering applications by Ross, Mc-Graw Hill.
EE-555
Neural Networks and Fuzzy Logic Lab

Marks: 50  
Credits : 2

Programming using MATLAB and Simulink:
1. Basics of neural network Toolbox
2. Basic programming for different algorithms:
   • Perceptron
   • Backpropagation.
   • Hopfield
   • ART
   • BAM
3. Basics of Fuzzy Logic Toolbox
4. Design of Neural network controller for an industrial application.
5. Design of Fuzzy logic controller for an industrial application.
EE-556
Industrial Training after fourth semester

Marks: 50  
Credits: 1  
L T P  
0 0 2

Students have to undergo industrial/institutional training at reputed industry/institute for the period of 4 to 6 weeks after the fourth semester.