

**SCHEME OF TEACHING & EXAMINATION
ELECTRICAL AND ELECTRONICS ENGINEERING
III SEMESTER**

Subject Code	Title	Teaching Department	Teaching hours/week		Examination			
			Theory	Practical	Duration	I. A	Theory/ Practical	Total Marks
06MAT - 31	Engineering Mathematics - III	Mat	04		03	25	100	125
06ES – 32	Analog Electronic Circuits	@	04		03	25	100	125
06ES – 33	Logic Design	@	04		03	25	100	125
06ES – 34	Network Analysis	@	04		03	25	100	125
06EE- 35	Electrical Measurements	@	04		03	25	100	125
06EE – 36	Field Theory	@	04		03	25	100	125
06ESL – 37	Analog Electronics Lab	@		03	03	25	50	75
06ESL – 38	Logic Design Lab	@		03	03	25	50	75
		Total	24	06	24	200	700	900

**SCHEME OF TEACHING & EXAMINATION
ELECTRICAL AND ELECTRONIC ENGINEERING
IV SEMESTER**

Subject Code	Title	Teaching Department	Teaching hours/week		Examination			
			Theory	Practical	Duration	I. A	Theory/ Practical	Total Marks
06MAT - 41	Engineering Mathematics - IV	Mat	04		03	25	100	125
06ES – 42	Microcontrollers	@	04		03	25	100	125
06ES – 43	Control Systems	@	04		03	25	100	125
06ES –36/ 44	Field Theory	@	04		03	25	100	125
06EE– 45	Power Electronics	@	04		03	25	100	125
06EE – 46	Transformers and Induction Machines	@	04		03	25	100	125
06ESL – 47	Microcontrollers Lab	@		03	03	25	50	75
06EEL – 48	Power Electronics Lab	@		03	03	25	50	75
		Total	24	06	24	200	700	900

THIRD SEMESTER (Common to EC/TC/EE/IT/BM/ML)SUBJECT CODE: **06ES32**

IA MARKS: 25

SUBJECT: **ANALOG ELECTRONIC CIRCUITS**

EXAM HOURS: 3

HOURS / WEEK: 4

EXAM MARKS: 100

TOTAL HOURS: 52

PART – A**UNIT 1:**

Diode Circuits: Diode Resistance, Diode equivalent circuits, Transition and diffusion capacitance, Reverse recovery time, Load line analysis, Rectifiers, Clippers and clampers. (Chapter 1.6 to 1.14, 2.1 to 2.9)

06 Hours**UNIT 2:**

Transistor Biasing: Operating point, Fixed bias circuits, Emitter stabilized biased circuits, Voltage divider biased, DC bias with voltage feedback, Miscellaneous bias configurations, Design operations, Transistor switching networks, PNP transistors, Bias stabilization. (Chapter 4.1 to 4.12)

07 Hours**UNIT 3:**

Transistor at Low Frequencies: BJT transistor modeling, Hybrid equivalent model, CE Fixed bias configuration, Voltage divider bias, Emitter follower, CB configuration, Collector feedback configuration, Hybrid equivalent model. (Chapter 5.1 to 5.3, 5.5 to 5.17)

07 Hours**UNIT 4:**

Transistor Frequency Response: General frequency considerations, low frequency response, Miller effect capacitance, High frequency response, multistage frequency effects. (Chapter 9.1 to 9.5, 9.6, 9.8, 9.9)

06 Hours

PART – B**UNIT 5:**

(a) **General Amplifiers:** Cascade connections, Cascode connections, Darlington connections. (Chapter 5.19 to 5.27)

03Hours

(b) **Feedback Amplifier:** Feedback concept, Feedback connections, Type, Practical feedback circuits. (Chapter 14.1 to 14.4)

03 Hours**UNIT 6:**

Power Amplifiers: Definitions and amplifier types, series fed class A amplifier, Transformer coupled Class A amplifiers, Class B amplifier operations, Class B amplifier circuits, Amplifier distortions. (Chapter 12.1 to 12.9)

07 Hours**UNIT 7:**

Oscillators: Oscillator operation, Phase shift Oscillator, Wienbridge Oscillator, Tuned Oscillator circuits, Crystal Oscillator. (Chapter 14.5 to 14.11) (BJT version only)

06 Hours**UNIT 8:**

FET Amplifiers: FET small signal model, Biasing of FET, Common drain common gate configurations, MOSFETs, FET amplifier networks. (Chapter 8.1 to 8.13)

07 Hours**TEXT BOOK:**

1. **Robert L. Boylestad and Louis Nashelsky**, “Electronic Devices and Circuit Theory”, PHI. 9TH Edition.

REFERENCE BOOKS:

1. **Jacob Millman & Christos C. Halkias**, 'Integrated Electronics', Tata - McGraw Hill, 1991 Edition

2. **David A. Bell**, "Electronic Devices and Circuits", PHI, 4th Edition, 2004

Question Paper Pattern: Student should answer FIVE full questions out of 8 questions to be set each carrying 20 marks, **selecting at least TWO questions from each part**

SUBJECT CODE: **06ES 33**

(Common EC/TC/EE/IT/BM/ML)

SUBJECT: LOGIC DESIGN

HOURS / WEEK: 4

TOTAL HOURS: 52

EXAM MARKS: 25

EXAM HOURS: 3

EXAM MARKS: 100

Part -A**Unit 1:**

Principles of combinational logic-1: Definition of combinational logic, Canonical forms, Generation of switching equations from truth tables, Karnaugh maps-3, 4 and 5 variables, Incompletely specified functions (Don't Care terms), Simplifying Max term equations. [(Text book 1) 3.1, 3.2, 3.3, 3.4]

7 Hours

Unit 2:

Principles of combinational Logic-2: Quine-McCluskey minimization technique- Quine-McCluskey using don't care terms, Reduced Prime Implicant Tables, Map entered variables [(Text book 1) 3.5, 3.6]

7 Hours

Unit 3:

Analysis and design of combinational logic - I: General approach, Decoders-BCD decoders, Encoders. [(Text book 1) 4.1, 4.3, 4.4]

6 Hours

Unit 4:

Analysis and design of combinational logic - II: Digital multiplexers- Using multiplexers as Boolean function generators. Adders and subtractors- Cascading full adders, Look ahead carry, Binary comparators. [(Text book 1) 4.5, 4.6 - 4.6.1, 4.6.2, 4.7]

6 Hours**Part –B****Unit 5:**

Sequential Circuits – 1: Basic Bistable Element, Latches, SR Latch, Application of SR Latch, A Switch Debouncer, The $\overline{S-R}$ Latch, The gated SR Latch, The gated D Latch, The Master-Slave Flip-Flops (Pulse-Triggered Flip-Flops): The Master-Slave SR Flip-Flops, The Master-Slave JK Flip-Flop, Edge Triggered Flip-Flop: The Positive-Edge-Triggered D Flip-Flop, Negative-Edge Triggered D Flip-Flop. [(Text book 2) 6.1, 6.2, 6.4, 6.5].

7 Hours**Unit 6:**

Sequential Circuits – 2: Characteristic Equations, Registers, Counters - Binary Ripple Counters, Synchronous Binary counters, Counters based on Shift Registers, Design of a Synchronous counters, Design of a Synchronous Mod-6 Counter using clocked JK Flip-Flops Design of a Synchronous Mod-6 Counter using clocked D, T, or SR Flip-Flops [(Text book 2) 6.6, 6.7, 6.8, 6.9 – 6.9.1 and 6.9.2]

7 Hours**Unit 7:**

Sequential Design - I: Introduction, Mealy and Moore Models, State Machine Notation, Synchronous Sequential Circuit Analysis, [(Text book 1) 6.1, 6.2, 6.3]

6 Hours**Unit 8:**

Sequential Design - II: Construction of state Diagrams, Counter Design [(Text book 1) 6.4, 6.5]

6 Hours

Text books:

1. John M Yarbrough, “Digital Logic Applications and Design”, Thomson Learning, 2001.
2. Donald D Givone, “Digital Principles and Design “, Tata McGraw Hill Edition, 2002.

Reference Books:

1. Charles H Roth, Jr; “Fundamentals of logic design”, Thomson Learning, 2004.
2. Mono and Kim, “Logic and computer design Fundamentals”, Pearson, Second edition, 2001.

Coverage of the Text Books:

Unit 1: (Text book 1) 3.1, 3.2, 3.3, 3.4

Unit 2: (Text book 1) 3.5, 3.6

Unit 3: (Text book 1) 4.1, 4.3, 4.4

Unit 4: [(Text book 1) 4.5, 4.6 - 4.6.1, 4.6.2, 4.7

Unit 5: (Text book 2) 6.1, 6.2, 6.4, 6.5

Unit 6: (Text book 2) 6.6, 6.7, 6.8, 6.9 – 6.9.1 and 6.9.2

Unit 7: (Text book 1) 6.1, 6.2, 6.3

Unit 8: (Text book 1) 6.4, 6.5

ELECTRICAL & ELECTRONICS ENGINEERING

SUBJECT CODE: **06ES34**
 SUBJECT: **NETWORK ANALYSIS**
 (Common EC/TC/EE/IT/BM/ML)
 HOURS / WEEK: 4

IA MARKS: 25
 EXAM HOURS: 3
 EXAM MARKS: 100
 TOTAL HOURS: 52

PART – A

UNIT 1:

Basic Concepts: Practical sources, Source transformations, Network reduction using Star – Delta transformation, Loop and node analysis With linearly dependent and independent sources for DC and AC networks, Concepts of super node and super mesh.

7 Hours

UNIT 2:

Network Topology: Graph of a network Concept of tree and co-tree, incidence matrix, tie-set, tie-set and cut-set schedules, Formulation of equilibrium equations in matrix form. Solution of resistive networks, Principle of duality.

7 Hours

UNIT 3:

Network Theorems - I: Superposition, Reciprocity and Millman's theorems.

06 Hours

UNIT 4:

Network Theorems - II:

Thevenin's and Norton's theorems; Maximum Power transfer theorem

06 Hours

PART – B

UNIT 5: Resonant Circuits: Series and parallel resonance, frequency-response of series and Parallel circuits, Q –factor, Bandwidth.

06Hours

UNIT 6:

Transient behavior and initial conditions: Behavior of circuit elements under switching condition and their Representation, evaluation of initial and final conditions in RL, RC and RLC circuits for AC and DC excitations.

07 Hours

UNIT 7:

Laplace Transformation & Applications Solution of networks, step, ramp and impulse responses, waveform Synthesis

07 Hours

UNIT 8:

Two port network parameters: Definition of z, y, h and transmission parameters, modeling with these parameters, relationship between parameters sets

06 Hours

TEXTBOOKS:

1. **M. E. Van Valkenburg**, “Network Analysis”, PHI / Pearson Education, 3rd Edition. Reprint 2002
2. **Roy Choudhury**, “Networks and systems”, 2nd edition, 2006 re-print, New Age International Publications

REFERENCE BOOKS :

1. **Hayt, Kemmerly and Durbin**, “Engineering Circuit Analysis”, TMH 6th Edition, 2002
2. **Franklin F. Kuo**, “Network analysis and Synthesis”, Wiley International Edition,
3. **David K. Cheng**, “Analysis of Linear Systems”, Narosa Publishing House, 11th reprint, 2002
4. **A. Bruce Carlson**, “Circuits”, Thomson Learning, 2000. Reprint 2002

Question Paper Pattern: Student should answer FIVE full questions out of 8 questions to be set each carrying 20 marks, **selecting at least TWO questions from each part**

Coverage in the Texts:

Unit 1: Text 2: 1.6, 2.3, 2.4 (Also refer **R1**:2.4, 4.1 to 4.6; 5.3, 5.6; 10.9
This book gives concepts of super node and super mesh)

Unit 2: Text 2: 3.1 to 3.11

Unit 3 and Unit 4: Text 2: 7.1 to 7.7

Unit 5: Text 2 – 8.1 to 8.6

Unit 6: Text 1 – Chapter 5;

Unit 7: Text 1 – 7.4 to 7.7; 8.1 to 8.5

Unit 8: Text 1 – 11.1 to 11.6

SUBJECT CODE: **06EE35**
SUBJECT: **ELECTRICAL MEASUREMENTS**
(For EE Only)
HOURS / WEEK: 4

IA MARKS: 25
EXAM HOURS: 3
EXAM MARKS: 100
TOTAL HOURS: 52

Unit-1.

(a) **Units and Dimensions:** Review of fundamental and derived units. S.I. units. Dimensional equations, problems. — **3 Hours (8 Marks)**

(b) **Measurement of Resistance, Inductance, and Capacitance:** Wheatstone's bridge — sensitivity analysis, limitations, Kelvin's double bridge. (4 Hrs -12 Marks)

Unit 2:

(a) Earth resistance measurement using megger. Measurement of earth resistance by fall of potential method, Anderson's bridge. Schering bridge. Sources and detectors, Shielding of bridges. Problems — **6 Hours (20 Marks)**

Unit 3:

Extension of Instrument Ranges: Shunts and multipliers. Construction and theory of instrument transformers, Equations for ratio and phase angle errors of C.T. and P.T. (derivations excluded). Turns compensation, illustrative examples (excluding problems on turns compensation) — **7 Hours (20 Marks)**

Unit 4:

Measurement of Power and Related Parameters: Dynamometer wattmeter. LPF wattmeter. Measurement of real and reactive power in three-phase circuits. Induction type energy meter — construction, theory, errors, adjustments and calibration. Principle of working of electronic energy meter. — **7 Hours (20 Marks)**

Unit 5:

(a) Construction and operation of electro-dynamometer single-phase power factor meter. Weston frequency meter and phase sequence indicator. – **3 Hours (10 Marks)**

(b) **Electronic Instruments:** Introduction. True RMS responding voltmeter. Electronic multimeters. Digital voltmeters. Q meter. **3 Hours (10 Marks)**

Unit 6:

Dual trace oscilloscope — front panel details of a typical dual trace oscilloscope. Method of measuring amplitude, phase, frequency, period. Use of Lissajous patterns. Working of a digital storage oscilloscope. — **7 Hours (20 Marks)**

Unit 7:

Transducers: Classification and selection of transducers. Strain gauges. LVDT. Temperature measurements. Photo conductive and photo-voltaic cells.— **6 Hours (20 Marks)**

Unit 8:

(a) Interfacing resistive transducers to electronic circuits. Introduction to data acquisition systems. – **2 Hous (8 Marks)**

(b) **Display Devices and Signal Generators:** X-Y recorders. Nixie tubes. LCD and LED displays. Signal generators and function generators. — **4 Hours (12 Marks)**

Text Books

1. A. K. Sawhney, "Electrical and Electronic Measurements and Instrumentation", Dhanpatrai and Sons, New Delhi.
2. Cooper D. and A.D. Heifrick, "Modern Electronic Instrumentation and Measuring Techniques", P.H.I.

References

1. Golding and Widdies, "Electrical Measurements and Measuring Instruments", Pitman.
2. David A. Bell, "Electronic Instrumentation and Measurement", 2nd Edition, P.H.I., 2006.
3. Harris, "Electric Measurements", John Wiley.

SUBJECT CODE: **06EE36**

IA MARKS: 25

SUBJECT: **ELECTRIC POWER GENERATION**

EXAM HOURS: 3

(For EE Only)

EXAM MARKS: 100

HOURS / WEEK: 4

TOTAL HOURS: 52

Unit 1:

Sources of Electrical Power: Wind, solar, fuel, tidal, geo-thermal, hydro-electric, thermal, diesel, gas, nuclear power plants (block diagram approach only). Concept of co-generation, Combined heat and power distributed generation. — **6 Hours (20 Marks)**

Unit 2:

Diesel electric plants. Gas turbine plants. Mini, micro, and bio generation. Concept of distributed generation. — **6 Hours (20 Marks)**

Unit 3:

(a) **Hydro Power Generation:** Selection of site. Classification of hydro-electric plants. General arrangement and operation. Hydroelectric plant power station structure and control. — **4 Hours (10 Marks)**

(b) **Thermal Power Generation:** Introduction. Main parts of a thermal power plant. Working. Plant layout. — **3 Hours (10 Marks)**

Unit 4:

Nuclear Power Station: Introduction. Adverse effects of fossil fuels. Pros and cons of nuclear power generation. Selection of site, cost, components of reactors. Description of fuel sources. Safety of nuclear power reactor. — **6 Hours (20 Marks)**

Unit 5:

Economics Aspects: Introduction. Terms commonly used in system operation. Diversity factor, load factor, plant capacity factor, plant use factor, plant utilization factor, loss factor, load duration curve. — **7 Hours (20 Marks)**

Unit 6:

(a) Power factor improvement and tariffs. Energy-load curve. Interconnection of power stations. — **3 Hours (10 Marks)**

(b) **Substations:** Introduction. Types. Bus bar arrangement. Schemes. Location. Substation equipment. Reactors and capacitors.— **4 Hours (10 Marks)**

Unit 7:

(a) Current limiting reactors. Symmetric short circuit MVA calculations. — **3 Hours (10 Marks)**

(b) **Grounding Systems:** Introduction. Resistance grounding systems. Neutral grounding. Ungrounded system. — **3 Hours (10 Marks)**

Unit 8:

Resonant grounding. Solid grounding, reactance grounding, resistance grounding. Earthing transformer. Neutral grounding transformer. **7 Hours (20 Marks)**

Text Books

1. A. Chakrabarti, M. L. Soni, and P.V. Gupta, "Power System Engineering", Dhanpat Rai and Co., New Delhi.
2. M. V. Deshpande, "Elements of Power System Design", A. H. Wheeler and Co.

References

1. S. M. Singh, "Electric Power Generation, Transmission and Distribution", P.H.I., New Delhi.

SUBJECT CODE: **06ESL 37**

SUBJECT: **ANALOG ELECTRONICS LAB**
(Common to EC/TC/EE/IT/BM/ML)

HOURS / WEEK: 3

IA MARKS: 25

EXAM HOURS: 3

EXAM MARKS: 50

1. Wiring of RC coupled Single stage FET & BJT amplifier and determination of the gain- frequency response, input and output impedances.
2. Wiring of BJT Darlington, Emitter follower with and without bootstrapping and determination of the gain, input and output impedances (Single circuit) (One Experiment)
3. Wiring of a two stage BJT Voltage series feed back amplifier and determination of the gain, Frequency response, input and output impedances with and without feedback (One Experiment)
4. Wiring and Testing for the performance of BJT-RC Phase shift Oscillator for $f_0 = 10$ KHz
5. Testing for the performance of BJT – Hartley & Colpitts Oscillators for RF range $f_0 = 100$ KHz.
6. Testing for the performance of BJT -Crystal Oscillator for $f_0 > 100$ KHz
- 7 Testing of Diode clipping (Single/Double ended) circuits for peak clipping, peak detection
8. Testing of Clamping circuits: positive clamping /negative clamping.

9. Testing of a transformer less Class – B push pull power amplifier and determination of its conversion efficiency.

10. Testing of Half wave, Full wave and Bridge Rectifier circuits with and without Capacitor filter. Determination of ripple factor, regulation and efficiency

11. Verification of Thevinin's Theorem and Maximum Power Transfer theorem for DC Circuits.

12. Characteristics of Series and Parallel resonant circuits.

SUBJECT CODE: **06ESL 38**

SUBJECT: LOGIC DESIGN LAB

(Common to EC/TC/EE/IT/BM/ML)

HOURS / WEEK: 3

TA MARKS: 25

EXAM HOURS: 3

EXAM MARKS: 50

Simplification, realization of Boolean expressions using logic gates/Universal gates.

Realization of Half/Full adder and Half/Full Subtractors using logic gates.

(i) Realization of parallel adder/Subtractors using 7483 chip

(ii) BCD to Excess-3 code conversion and vice versa.

Realization of Binary to Gray code conversion and vice versa

MUX/DEMUX – use of 74153, 74139 for arithmetic circuits and code converter.

Realization of One/Two bit comparator and study of 7485 magnitude comparator.

Use of a) Decoder chip to drive LED display and b) Priority encoder.

Truth table verification of Flip-Flops: (i) JK Master slave (ii) T type and (iii) D type.

Realization of 3 bit counters as a sequential circuit and MOD – N counter design (7476, 7490, 74192, 74193).

Shift left; Shift right, SIPO, SISO, PISO, PIPO operations using 74S95.

Wiring and testing Ring counter/Johnson counter.

Wiring and testing of Sequence generator.

FOURTH SEMESTER

SUBJECT CODE: 06ES42

IA MARKS: 25

SUBJECT: MICROCONTROLLERS

EXAM HOURS: 3

(Common to, EE, EC, IT, TC, BM and ML)

EXAM MARKS: 100

HOURS / WEEK: 4

TOTAL HOURS: 52

PART – A

UNIT 1:

Microprocessors and microcontroller. Introduction, Microprocessors and Microcontrollers, A Microprocessors survey. RISC & CISC CPU Architectures, Harvard & Von-Neumann CPU architecture

The 8051 Architecture: Introduction, 8051 Microcontroller Hardware, Input / Output Pins, Ports and Circuits External Memory, Counter and Timers, Serial Data Input / Output, Interrupts.

07 Hrs

UNIT 2:

Addressing Modes and Operations: Introduction, Addressing modes, External data Moves, Code Memory, Read Only Data Moves / Indexed Addressing mode, PUSH and POP OpCodes, Data exchanges, Example Programs; Byte level logical Operations, Bit level Logical Operations, Rotate and Swap Operations, Example Programs. Arithmetic Operations: Flags, Incrementing and Decrementing, Addition, Subtraction, Multiplication and Division, Decimal Arithmetic, Example Programs.

07 Hrs.

UNIT 3:

Jump and Call Instructions: The JUMP and CALL Program range, Jumps, calls and Subroutines, Interrupts and Returns, More Detail on Interrupts, Example Programs.

06 Hrs.

UNIT 4:

8051 programming in C: Data types and time delays in 8051C, I/O programming, logic operations, data conversion programs, accessing code ROM space, data serialization.

06 Hrs

PART – B

UNIT 5:

Timer / Counter Programming in 8051: Programming 8051 Timers, Counter Programming, programming timers 0 and 1 in 8051 C

06 Hrs

UNIT 6:

8051 Serial Communication: Basics of Serial Communication, 8051 connections to RS-232, 8051 Serial communication Programming, Programming the second serial port, Serial port programming in C.

07 Hrs

UNIT 7:

Interrupts Programming: 8051 Interrupts, Programming Timer Interrupts, Programming External Hardware Interrupts, Programming the Serial Communication Interrupts, Interrupt Priority in the 8051/52, Interrupt programming in C

06 Hrs

UNIT 8:

8051 Interfacing and Applications: Interfacing 8051 to LCD, Keyboard, parallel and serial ADC DAC, Stepper motor interfacing, DC motor interfacing and PWM

07 Hrs

Text Books

1. **Kenneth J. Ayala** ; “The 8051 Microcontroller Architecture, Programming & Applications” 2e, Penram International, 1996 / Thomson Learning 2005
2. **Muhammad Ali Mazidi and Janice Gillespie Mazidi and Rollin D. McKinlay**; “The 8051 Microcontroller and Embedded Systems – using assembly and C ”- PHI, 2006 / Pearson, 2006

Reference Book:

1. **Predko** ; “Programming and Customizing the 8051 Microcontroller” –, TMH
2. **Raj Kamal**, “Microcontrollers: Architecture, Programming, Interfacing and System Design”, Pearson Education, 2005
3. **Ajay V.Deshmukh**; “Microcontrollers- Theory and Applications”,TMH,2005
4. **Dr.Ramani Kalpathi and Ganesh Raja**; “Microcontroller and its applications”, Sanguine Technical publishers,Bangalore-2005

Question Paper Pattern: Student should answer FIVE full questions out of 8 questions to be set each carrying 20 marks, **selecting at least TWO questions from each part**

Coverage in the Text books:

UNIT 1:Text 1 – Chapter 1(excluding 1.3 and 1.4) and chapter 3, R1 - chapter 1

UNIT 2:Text 1-chapters 5, 6 & 7

UNIT 3: Text 1 - chapter 8

UNIT 4:Text 2 – chapter 7

UNIT 5: Text 2 – chapter 9

UNIT 6: Text 2 – chapter 10

UNIT 7: Text 2 – chapter 11

UNIT 8: Text 2 – chapter 12, chapter 13(13.1&13.2), chapter 17 (except 17.1)

SUBJECT CODE: **06ES43**
SUBJECT: **CONTROL SYSTEMS**
(Common to EC/TC/EE/IT/BM/ML)
HOURS / WEEK: 4

IA MARKS: 25
EXAM HOURS: 3
EXAM MARKS: 100
TOTAL HOURS: 52

PART – A

UNIT 1:

Modeling of Systems: The control system, Mathematical models of physical systems – Introduction, Differential equations of physical systems – Mechanical systems, Friction, Translational systems (Mechanical accelerometer, Levered systems excluded), Rotational systems, Gear trains, Electrical systems, Analogous systems

06 Hours

UNIT 2:

Block diagrams and signal flow graphs: Transfer functions, Block diagram algebra, Signal Flow graphs (State variable formulation excluded),

07 Hours

UNIT 3:

Time Response of feedback control systems: Standard test signals, Unit step response of First and second order systems, Time response specifications, Time response specifications of second order systems, steady – static errors and error constants.

07 Hours

UNIT 4:

Stability analysis: Concepts of stability, Necessary conditions for Stability, Routh- stability criterion, Relative stability analysis; More on the Routh stability criterion.

06 Hours

PART – B

UNIT 5:

Root-Locus Techniques: Introduction, The root locus concepts, Construction of root loci.

06 Hours

UNIT 6:

Stability in the frequency domain: Mathematical preliminaries, Nyquist Stability criterion, (Inverse polar plots excluded), Assessment of relative stability using Nyquist criterion, (Systems with transportation lag excluded).

07 Hours

UNIT 7:

Frequency domain analysis: Introduction, Correlation between time and frequency response, Bode plots, All pass and minimum phase systems, Experimental determination of transfer functions, Assessment of relative stability using Bode Plots.

07 Hours

UNIT 8:

Introduction to State Variable analysis: Concepts of state, state variable and state models for electrical systems, Solution of state equations.

06 Hours

TEXT BOOK:

I. J. Nagarath and M.Gopal, “Control Systems Engineering”, New Age International (P) Limited, Publishers, Fourth edition – 2005

REFERENCE BOOKS:

1. K. Ogata, “Modern Control Engineering “, Pearson Education Asia/ PHI, 4th Edition, 2002.
2. P. S. Satyanarayana; “Concepts of Control Systems”, Dynaram publishers, Bangalore, 2001
3. M. Gopal, “Control Systems – Principles and Design”, TMH, 1999

4. J. J. D’Azzo and C. H. Houppis; “Feedback control system analysis and synthesis”, McGraw Hill, International student Edition.

Question Paper Pattern: Student should answer FIVE full questions out of 8 questions to be set each carrying 20 marks, **selecting at least TWO questions from each part**

COVERAGE IN THE TEXT BOOK:

UNIT 1: 1.1, 2.1, 2.2, 2.7

UNIT 2: 2.4, 2.5, 2.6, 2.7

UNIT 3: 5.1, 5.2, 5.3, 5.4, 5.5

UNIT 4: 6.1, 6.2, 6.4, 6.5, 6.6

UNIT 5: 7.1, 7.2, 7.3

UNIT 6: 9.1, 9.2, 9.3, 9.4,

UNIT 7: 8.1, 8.2, 8.4, 8.5, 8.6

UNIT 8: 12.1, 12.2, 12.3, 12.6

SUBJECT CODE: **06ES 36 / 44**

SUBJECT: **FIELD THEORY**
(Common to EC/TC/ML/EE)

HOURS / WEEK: 4

IA MARKS: 25

EXAM HOURS: 3

EXAM MARKS: 100

TOTAL HOURS: 52

PART – A

UNIT 1:

a. Coulomb’s Law and electric field intensity: Experimental law of Coulomb; Electric field intensity, Field due to continuous volume charge distribution, Field of a line charge (Chapter 2 – 2.1, 2.2, 2.3 2.4)

03 Hours

b. Electric flux density, Gauss’ law and divergence: Electric flux density, Gauss’ law, Divergence, Maxwell’s First equation(Electrostatics), vector operator $\vec{\nabla}$ and divergence theorem(Chapter 3 – 3.1, 3.2, 3.5, 3.6, 3.7)

04 Hours

UNIT 2:

a. Energy and potential : Energy expended in moving a point charge in an electric field, The line integral, Definition of potential difference and Potential, The potential field of a point charge and system of charges, Potential gradient , Energy density in an electrostatic field (Chapter 4 – 4.1, 4.2, 4.3, 4.4, 4.5 4.6, 4.8)

04 Hours

b. Conductors, dielectrics and capacitance: Current and current density, Continuity of current, metallic conductors, Conductor properties and boundary conditions, boundary conditions for perfect Dielectrics, capacitance and examples. (Chapter 5 - 5.1, 5.2, 5.3, 5.4; Chapter 6 - 6.2, 6.3, 6.4)

03 Hours**UNIT 3:**

Poisson's and Laplace's equations: Derivations of Poisson's and Laplace's Equations, Uniqueness theorem, Examples of the solutions of Laplace's and Poisson's equations (Chapter 7 – 7.1, 7.2, 7.3, 7.4)

06 Hours**UNIT 4:**

The steady magnetic field: Biot-Savart law, Ampere's circuital law, Curl, Stokes' theorem, magnetic flux and flux density, scalar and Vector magnetic potentials
(Chapter 8 – 8.1, 8.2, 8.3, 8.4, 8.5, 8.6)

06 Hours**PART – B****UNIT 5:**

a. Magnetic forces: Force on a moving charge and differential current element, Force between differential current elements, Force and torque on a closed circuit. (Chapter 9 – 9.1, 9.2, 9.3, 9.4)

03 Hours

b. Magnetic materials and inductance: Magnetization and permeability, Magnetic boundary conditions, Magnetic circuit, Potential energy and forces on magnetic materials, Inductance and Mutual Inductance.(Chapter 9 – 9.6, 9.7, 9.8, 9.9, 9.10)

04 Hours

UNIT 6:

Time varying fields and Maxwell's equations: Faraday's law, displacement current, Maxwell's equation in point and Integral form, retarded potentials(Chapter 10)

06 Hours**UNIT 7:**

Uniform plane wave: Wave propagation in free space and dielectrics, Poynting's theorem and wave power, propagation in good conductors (skin effect).

(Chapter 12 – 12.1 to 12.4)

07 Hours**UNIT 8:**

Plane waves at boundaries and in dispersive media: Reflection of uniform plane waves at normal incidence, SWR, Plane wave propagation in general directions.

(Chapter 13 – 13.1, 13.2, 13.4)

06 Hours**TEXT BOOK:**

William H Hayt Jr. and John A Buck, "Engineering Electromagnetics", Tata McGraw-Hill, 7th edition, 2006

REFERENCE BOOKS :

1. John Krauss and David A Fleisch, "Electromagnetics with Applications", McGraw Hill, 5th edition, 1999
2. Edward C. Jordan and Keith G Balmain, "Electromagnetic Waves And Radiating Systems, Prentice – Hall of India / Pearson Education, 2nd edition, 1968 Reprint 2002
3. David K Cheng, "Field and Wave Electromagnetics" Pearson Education Asia 2nd edition, - 1989, Indian Reprint – 2001.
4. Matthew N.O. Sadiku, Elements of Electromagnetics, 3rd Edition, Oxford University Press, 2000, ISBN: 0-19-514497-X.

Question Paper Pattern: Student should answer FIVE full questions out of 8 questions to be set each carrying 20 marks, **selecting at least TWO questions from each part**

Coverage in the Text book:

UNIT 1: (a) Chapter 2 (b) Chapter 3

UNIT 2: (a) Chapter 4 except section 4.7

(b) Chapter 5 (except sections 5.5 and 5.6); 6.2, 6.3, 6.4

UNIT 3: Chapter 7 except sections 7.5 and 7.6

UNIT 4: Chapter 8 except section 8.7

UNIT 5: Chapter 9 except Section 9.5

UNIT 6: Chapter 10

UNIT 7: Chapter 12

UNIT 8: Chapter 13 – 13.1, 13.2, 13.4, 13.7

SUBJECT CODE: **06EE45**

SUBJECT: POWER ELECTRONICS

(For EE Only)

HOURS / WEEK: 4

EXAM MARKS: 25

EXAM HOURS: 3

EXAM MARKS: 100

TOTAL HOURS: 52

Part A

Unit 1:

Introduction, Power Semiconductor Devices:

Applications of Power Electronics, Power semiconductor devices, Control Characteristics. Types of power electronic circuits. Peripheral effects. – **6 hours (20 Marks)**

Unit 2:

Power Transistors: Power BJT's – switching characteristics, switching limits, base drive control. Power MOSFET's – switching characteristics, gate drive. IGBT's, di/dt and dv/dt limitations. Isolation of gate and base drives. Simple design of gate and base drives. – **6 Hours (20 marks)**

Unit 3:

Thyristors

Introduction, characteristics. Two Transistor Model. Turn-on and turn-off, di/dt and dv/dt protection. Thyristor types. Series and parallel operation of Thyristors. Thyristor firing circuits. Sample design of firing circuits using UJT, op-amps, and digital IC's. – **7 Hours (20 Marks)**

Unit 4:

Communication Techniques: Introduction. Natural Commutation. Forced commutation: self commutation, impulse commutation, resonant pulse commutation and complementary commutation. – **6 Hours (20 Marks)**

Unit 5: AC Voltage Controllers: Introduction. Principle of ON-OFF and phase control. Single-phase bidirectional controllers with resistive and inductive loads.– **6 Hours (20 Marks)**

Unit 6:

Controlled Rectifiers: Introduction. Principle of phase controlled converter operation. Single- phase semi-converters. Full converters. Three-phase half-wave converters. Three-phase full-wave converters. – **6 Hours (20 Marks)**

Unit 7:

DC Choppers: Introduction. Principle of step-down and step-up chopper with R-L load. Performance parameters. Chopper classification. Analysis of impulse commutated thyristor chopper (only qualitative analysis) – **7 Hours (20 Marks)**

Unit 8:

Inverters: Introduction. Principle of operation. Performance parameters. Single-phase bridge inverters. Threephase inverters. Voltage control of single-phase inverters – single pulse width, multiple pulse width, and sinusoidal pulse width modulation. Current source inverters. Variable D.C. link inverter. – **7 Hours (20 Marks)**

Text Book:

1) M.H.Rashid “Power Electronics”, 2nd Edition, P.H.I. /Pearson, New Delhi, 2002

References

1. Net Mohan, Tore M. Undeland, and William P. Robins, "Power Electronics – Converters, Applications and Design", Third Edition, John Wiley and Sons.
2. G.K. Dubey, S.R. Doradla, A. Joshi and R.M.K. Sinha, "Thyristorised Power Controllers", New Age International Publishers.
3. M.D. Singh and Khanchandani K.B., "Power Electronics", T.M.H., 2001.
4. Cyril Lander, "Power Electronics", 3rd Edition, McGraw-Hill.
5. J.M. Jacob, "Power Electronics: Principles and Applications", Thomson – Vikas Publications.
6. R.S. Ananda Murthy and V. Nattarasu, "Power Electronics : A Simplified Approach", Sanguine Technical Publishers.

SUBJECT CODE: **06EE46**

SUBJECT: **TRANSFORMERS AND
INDUCTION MACHINES**

(For EE Only)

HOURS / WEEK: 4

IA MARKS: 25

EXAM HOURS: 3

EXAM MARKS: 100

TOTAL HOURS: 52

Unit 1:

Basic Concepts: Concept of coupled circuits. Dot convention. Writing network equilibrium equations in coupled circuits (problems on coupled circuits excluded). Principle of transformer action for voltage transformation. Constructional details of shell type and core type of single-phase and three-phase transformers. Description of the following types of transformers — power transformer, distribution transformer, constant voltage transformer, constant current transformer, variable frequency transformers, auto-transformers. — **6 Hours (20 Marks)**

Unit 2:

Single-phase Transformers: Concept of ideal transformer. Equation for E.M.F. induced in the two windings. Voltage transformation ratio. Ideal transformer on no-load and loaded condition with corresponding phasor diagrams. Concept of M.M.F. balance in the magnetic circuit of an ideal

transformer. Current transformation ratio. Concept of referring impedance connected on one side of ideal transformer to the other side. Practical transformer – how it deviates from the ideal transformer. Development of exact equivalent circuit of a practical transformer – visualization of a practical transformer as an ideal transformer combined with imperfections of electric and magnetic circuits. Approximate equivalent circuit of a practical transformer. – **6 Hours (20 Marks)**

Unit 3:

Phasor diagram of a practical transformer for both no-load and loaded conditions. Losses, power and all-day efficiency, regulation. Testing of transformers — O.C. test, S.C. test and predetermination of efficiency and regulation. Sumpner's test. Parallel operation — need, conditions to be satisfied for parallel operation. Load sharing. — **6 Hours (20 Marks)**

Unit 4:

Three-phase Transformers: All types of three-phase transformer connections including open delta. Choice of connection. Bank of single-phase transformers for three-phase operation. Phase conversion using transformers. Scott connection for three-phase to two-phase conversion. Labeling of three-phase transformer terminals, phase shift between primary and secondary and vector groups. Conditions for proper operation of three-phase transformers in parallel. — **7 Hours (20 Marks)**

Unit 5:

(a) Three-winding Transformers: Advantages and disadvantages of three-winding transformers. Equivalent circuit. — **2 Hours (5 Marks)**

(b) Basic Concepts of Induction Machines: Concept of rotating magnetic field. Operating principle, construction, classification and types — single-phase, three-phase, squirrel-cage, slip-ring, double-cage types.— **5 Hours (15 Marks)**

Unit 6:

Three-phase Induction Motor: Phasor diagram of induction motor on no-load and loaded conditions. Visualization of a three-phase induction motor as a generalized transformer with a rotating secondary and obtaining its equivalent circuit. Different kinds of power losses in an induction motor.

Efficiency. Performance evaluation — output power, torque, efficiency, current and power factor. – **7 Hours (20 Marks)**

Unit 7:

Torque-slip characteristics covering motoring, generating and braking regions of operation. Induction generator. No-load and blocked rotor tests. Circle diagram and therefrom performance evaluation of the motor. Cogging and crawling. Equivalent circuit and performance of double-cage and deep-bar motors. — **6 Hours (20 Marks)**

Unit 8:

(a) Starting and Control of Three-phase Induction Motor: Need for starter. DOL, Y-Delta and auto-transformer starting. Rotor resistance starting. Electronic starters (any one type). Speed control — voltage, frequency, and rotor resistance variations.— **4 Hours (10 Marks)**

(b) Single-phase Induction Motor: Double revolving field theory and principle of operation. Types of single phase induction motors: split-phase, capacitor start, shaded pole motors. — **3 Hours (10 Marks)**

Text Books

1. Alexander Langsdorf, “Theory of Alternating Current Machines”, T.M.H.
2. I. J. Nagrath and D. P. Kothari, “Electric Machines”, 2nd Edition, T.M.H., ISBN 0-07-463285-X.

References

1. M. G. Say, “Performance and Design of A.C. Machines”, C.B.S. Publishers.
2. Ashfaq Hussain, “Electrical Machines”, Dhanpatrai and Co.
3. Kosco, “Electrical Machines and Transformers”, P.H.I.

SUBJECT CODE: **06ESL47**
 SUBJECT: **MICROCONTROLLERS LAB**
 (Common to, EE, EC, IT, TC, BM and ML)
 HOURS / WEEK: 3

IA MARKS: 25
 EXAM HOURS: 3
 EXAM MARKS: 50
 TOTAL HOURS: 42

I. PROGRAMMING

1. Data Transfer - Block move, Exchange, Sorting, Finding largest element in an array
2. Arithmetic Instructions - Addition/subtraction, multiplication and division, square, Cube – (16 bits Arithmetic operations – bit addressable)
3. Counters
4. Boolean & Logical Instructions (Bit manipulations)
5. Conditional CALL & RETURN
6. Code conversion: BCD – ASCII; ASCII – Decimal; Decimal - ASCII; HEX - Decimal and Decimal - HEX
7. Programs to generate delay, Programs using serial port and on-Chip timer / counter

II. INTERFACING:

Write C programs to interface 8051 chip to Interfacing modules to develop single chip solutions

8. Simple Calculator using 6 digit seven segment display and Hex Keyboard interface to 8051
9. Alphanumeric LCD panel and Hex keypad input interface to 8051
10. External ADC and Temperature control interface to 8051
11. Generate different waveforms Sine, Square, Triangular, Ramp etc. using DAC interface to 8051; change the frequency and amplitude
12. Stepper and DC motor control interface to 8051
- 13.. Elevator interface to 8051

SUBJECT CODE: **06EEL48**
SUBJECT: **POWER ELECTRONICS LAB**
(For EE Only)
HOURS / WEEK: 3

IA MARKS: 25
EXAM HOURS: 3
EXAM MARKS: 50
TOTAL HOURS: 42

NOTE: Each student has to do any one of the experiments given below in the examination individually.

1. Static characteristics of SCR.
2. Static characteristics of MOSFET and IGBT.
3. SCR turn-on circuit using synchronized UJT relaxation oscillator.
4. SCR Digital triggering circuit for a single-phase controlled rectifier OR A.C. voltage controller.
5. Single-phase full-wave rectifier with R and $R-L$ loads.
6. A.C. voltage controller using TRIAC and diac combination connected to R and $R-L$ loads.
7. Speed control of a separately excited D.C. motor using an IGBT or MOSFET chopper.
8. Speed control of a stepper motor.
9. Speed control of a universal motor and a single-phase induction motor using A.C. voltage controller.
10. MOSFET, OR IGBT based single-phase full-bridge inverter connected to R load.
