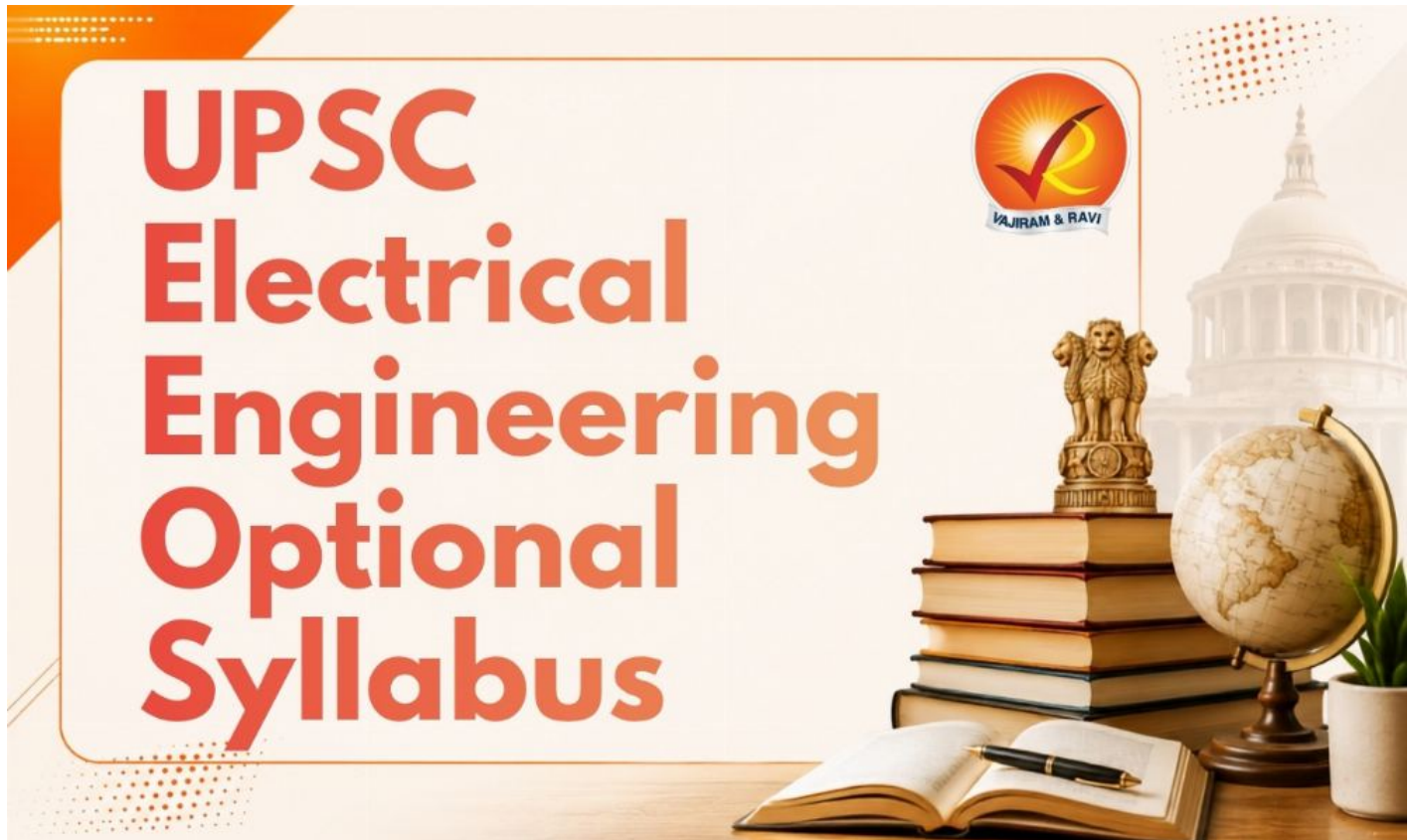


UPSC Electrical Engineering Optional Syllabus 2026 for CSE Mains Paper 1 & 2

August 1, 2026 • vajiramandravi.com



The UPSC offers 48 optional subjects for Mains Exams, with Electrical Engineering being one of them. The UPSC Electrical Engineering Syllabus emphasizes understanding core concepts and applying them in areas such as Analog and Digital Electronics, Power Systems, Microprocessors, Power System Protection, Measurement, and Instrumentation. For candidates choosing this subject, having a clear grasp of the fundamentals is essential. In this article, we will explore the detailed UPSC Electrical Engineering Optional Syllabus effective preparation.

UPSC Electrical Engineering Syllabus

Electrical Engineering is a preferred optional subject in the UPSC Mains Exam, especially for candidates with an academic background in the field. It is recommended to choose this subject only if you have a solid understanding of core concepts. Following the latest UPSC Electrical Engineering Syllabus is essential to stay aligned with the exam requirements.

Over the past five years, around 160-200 candidates have opted for this subject, with a consistent success rate of approximately 8%. Based on previous years' analysis, the difficulty level of Electrical Engineering questions in the

UPSC Mains is generally moderate.

UPSC Electrical Engineering Syllabus for Paper 1

The UPSC Electrical Engineering Syllabus for Paper 1 includes the topics covered during their engineering course including subjects like Circuit Theory, Signals & Systems, E.M. Theory, Digital Electronics, Energy Conversion, Power Electronics and Electric Drives, and Analog Communication. For a detailed subject description, refer to the table below.

UPSC Electrical Engineering Syllabus for Paper 1	
Topics	Sub-Topics
Circuits Theory	• Circuit components, network graphs, KCL, KVL, circuit analysis methods: nodal analysis, mesh analysis, basic network theorems, and applications. • Transient analysis: RL, RC, and RLC circuits, sinusoidal steady-state analysis, resonant circuits, coupled circuits, and balanced 3-phase circuits. two-port networks.
Signals and Systems	• Representation of continuous-time and discrete-time signals and systems. • LTI systems, convolution, impulse response, time-domain analysis of LTI systems based on convolution and differential/difference equations. • Fourier transforms, Laplace, transform, Z-transform, Transfer function. • Sampling and recovery of signals DFT, FFT Processing of analog signals through discrete-time systems.
E.M. Theory	• Maxwell's equations, wave propagation in bounded media. • Boundary conditions, reflection, and refraction of plane waves. • Transmission lines: traveling and standing waves, impedance matching, Smith chart.
Analog Electronics	• Characteristics and equivalent circuits (large and small-signal) of Diode, BJT, JFET, and MOSFET. • Diode circuits: Clipping, clamping, rectifier. • Biasing and bias stability. FET amplifiers. Current mirror. • Amplifiers: single-and multi-stage, differential, operational feedback, and power. Analysis of amplifiers, a frequency response of amplifiers. OPAMP circuits. • filters, sinusoidal oscillators: criterion for oscillation, single-transistor, and OPAMP configurations. • Function generators and wave-shaping circuits. Linear and switching power supplies.

Digital Electronics	• Boolean algebra, minimization of Boolean functions, logic gates, digital IC families (DTL, TTL, ECL, MOS, CMOS). • Combinational circuits: arithmetic circuits, code converters, multiplexers, and decoders. • Sequential circuits: latches and flip-flops, counters and shift registers. • Comparators, timers, multivibrators. Sample and hold circuits, ADCs, and DACs. • Semiconductor memories. Logic implementation using programmable devices (ROM, PLA, FPGA).
Energy Conversion	• Principles of electromechanical energy conversion: Torque and emf in rotating machines. • DC machines: characteristics and performance analysis, starting and speed control of motors. • Transformers: principles of operation and analysis, regulation, efficiency, 3-phase transformers. • 3-phase induction machines and synchronous machines: characteristics and performance analysis, speed control.
Power Electronics and Electric Drives	• Semiconductor power devices: diode, transistor, thyristor, triac, GTO, and MOSFET static characteristics and principles of operation, triggering circuits, phase control rectifiers. • Bridge converters: fully-controlled and half-controlled, principles of thyristor choppers and inverters, DC-DC converters, Switch mode inverter, basic concepts of speed control of dc and ac motor drives applications of variable-speed drives.
Analog Communication	• Random variables: continuous, discrete, probability, probability functions. Statistical averages, probability models. • Random signals and noise: white noise, noise equivalent bandwidth, signal transmission with noise, signal to noise ratio. • Linear CW modulation: Amplitude modulation: DSB, DSB-SC, and SSB. Modulators and Demodulators. Phase and Frequency modulation: PM & FM signals, narrow band FM, generation & detection of FM and PM, Deemphasis, Preemphasis. • CW modulation system: Superheterodyne receivers, AM receivers, communication receivers, FM receivers, phase-locked loop, SSB receiver Signal to noise ratio calculation for AM and FM receivers.

UPSC Electrical Engineering Syllabus for Paper 2

The UPSC Electrical Engineering Syllabus for Paper 2 includes the topics like Control Systems, Microprocessors and Microcomputers, Measurement and Instrumentation, Power Systems: Analysis and Control, Power System Protection, and Digital Communication. For a detailed subject description, refer to the table below.

UPSC Electrical Engineering Syllabus for Paper 2	
Topics	Sub-Topics
Control Systems	• Elements of control systems, block-diagram representations, open-loop & closed-loop systems, principles and applications of feedback. • Control system components. LTI systems: time-domain and transform-domain analysis. • Stability: Routh Hurwitz criterion, root-loci, Bode-plots, and polar plots, Nyquist's criterion, Design of lead-lag compensators. • Proportional, PI, PID controllers. State-variable representation and analysis of control systems.
Microprocessors and Microcomputers	• PC organization, CPU, instruction set, register setting diagram, programming, interrupts Memory interfacing, I/O interfacing, and programmable peripheral devices.
Measurement and Instrumentation	• Error analysis, measurement of current-voltage, power, energy, power factor, resistance, inductance, capacitance and frequency, bridge measurements. Signal conditioning circuit. • Electronic measuring instruments: multimeter, CRO, digital voltmeter, frequency counter, Q-meter, spectrum analyzer, distortion-meter. • Transducers: thermocouple, thermistor, LVDT, strain-gauge, piezo-electric crystal.
Power Systems	• Analysis and Control: Steady-state performance of overhead transmission lines and cables, principles of active and reactive power transfer and distribution, per-unit quantities, bus admittance and impedance matrices, load flow, voltage control and power factor correction, economic operation, symmetrical components, analysis of symmetrical and unsymmetrical faults. • Concepts of system stability: swing curves and equal area criterion. Static VAR system. Basic concepts of HVDC transmission.
Power System Protection	• Principles of overcurrent, differential, and distance protection. Concept of solid-state relays. • Circuit breakers. Computer-aided protection: Introduction, line, bus, generator, transformer protection, numeric relays, and application of DSP to protection.

Digital Communication	• Pulse code modulation (PCM), differential pulse code modulation (DPCM), delta modulation (DM), Digital modulation, and demodulation schemes: amplitude, phase, and frequency keying schemes (ASK, PSK, FSK). • Error control coding: error detection and correction, linear block codes, convolution codes. • Information measure and source coding. Data networks, 7-layer architecture.
-----------------------	---

UPSC Electrical Engineering Optional Syllabus PDF

The UPSC Electrical Engineering Optional Syllabus consists of two papers — Paper 1 and Paper 2, each carrying a weightage of 250 marks. Both papers cover around 4 major subjects. Below is a direct link for UPSC Electrical Engineering Optional Syllabus PDF for candidates who are opting for Electrical Engineering as their optional subject.

UPSC Electrical Engineering Optional Syllabus 2026 Preparation Strategy

Preparing for the Electrical Engineering Optional in the UPSC Mains requires a focused and well-planned strategy. Candidates who are opting as optional subject can refer the below discussed UPSC Electrical Engineering Optional Syllabus Preparation Strategy:

1. Start by thoroughly going through the Electrical Engineering syllabus. Break it down into topics and subtopics to create a structured study plan.
2. Choose standard textbooks and reference materials as per the syllabus for in-depth preparation.
3. Prepare concise notes, especially for important formulas and concepts for quick revision.
4. Enhance your presentation and time management skills by solving previous year's papers and participating in a test series.
5. Attempt past UPSC Electrical Engineering optional papers to understand the exam pattern, question types, and time management. This helps identify strengths and areas needing improvement.
6. Analyze your performance after each test and revise challenging topics.
7. Allocate dedicated time for consistent revision and problem-solving to strengthen your understanding.
8. Consider joining an Electrical Engineering Optional coaching or seeking mentorship for expert feedback and guidance.
9. Keep track of technological advancements, government policies, and industry updates related to Electrical Engineering. This knowledge will be useful in both the written exam and the interview.

UPSC Electrical Engineering Optional Books

To effectively cover the Electrical Engineering Optional Syllabus for the UPSC Mains, candidates should refer to the standard reference books which helps in building conceptual clarity. Below we have shared the list of UPSC Electrical Engineering Optional Books that an appearing candidate who is opting for the Electrical Engineering as the optional subject:

UPSC Electrical Engineering Optional Books

S. No.	Book Title	Author(s)
1	Electromagnetic Fields & Waves	Kd Prasad
2	Energy Conversion	Ashfaq Hussain
3	Circuit Theory: Analysis and Synthesis	A. Chakrabarti
4	Signals and Systems	Alan V. Oppenheim, Alan V. Willsky, S. Hamid Nawab
5	Physics of Semiconductor Devices	Simon Sze
6	Analog Electronics	J.B. Gupta
7	Digital Logic and Computer Design	M. Morris Mano
8	Principles of Electronics	V .K. Mehta
9	Radio Engineering	G.K. Mithal
10	Circuit Analysis	Gupta
11	Electrical Technology	Thareja
12	Automatic Control System	Benjamin C. Kuo
13	Elements of Engineering Electromagnetics	Nannapaneni Rao
14	Electromagnetic Waves and Field	R.N. Singh
15	Control Systems Engineering	Nagrath Gopal
16	Semiconductor	Nag Choudhary

17	Integrated Circuits	D. Roy Choudhary
18	Network Analysis	Valkenburg
19	Basic Current Analysis	Murthy
20	Electromagnetic Waves and Radiating System	Jordan & Balmain
21	Modern Central Engineering	Katsuhiko Ogata
22	Microprocessors and Microcomputers	R. S Gaonkar
23	Topics in Communication Theory	David Middleton

Other Related UPSC Optional Syllabus		
UPSC Commerce Optional Syllabus	UPSC Geography Optional Syllabus	UPSC Geology Optional Syllabus
UPSC History Optional Syllabus	UPSC Law Optional Syllabus	UPSC Maths Optional Syllabus
UPSC Medical Science Optional Syllabus	UPSC Philosophy Optional Syllabus	UPSC Physics Optional Syllabus
UPSC PSIR Optional Syllabus	UPSC Psychology Optional Syllabus	UPSC Sociology Optional Syllabus
UPSC Zoology Optional Syllabus	UPSC Economics Optional Syllabus	UPSC Agriculture Optional Syllabus
UPSC Anthropology Optional Syllabus	UPSC Botany Optional Syllabus	UPSC Chemistry Optional Syllabus
UPSC Civil Engineering Optional Syllabus	UPSC Management Optional Syllabus	UPSC Mechanical Engineering Optional Syllabus

Other Related UPSC Optional Syllabus		
UPSC Public Administration Optional Syllabus	UPSC Statistics Optional Syllabus	UPSC Electrical Engineering Optional Syllabus
UPSC Animal Husbandry & Veterinary Science Optional Syllabus		

Source: <https://vajiramandravi.com/upsc-exam/upsc-electrical-engineering-optional-syllabus/>

© Vajiram & Ravi. For personal use only.