

**LEAD Institute of Academics**  
**Text Books for GATE - IN (Instrumentation Engineering)**

| S.No. | Subject                  | Text Book  | Topics  | Marks in GATE |
|-------|--------------------------|--|---|---------------|
| 1     | Linear Algebra           | 1. Matrices – A R Vasista  | <ul style="list-style-type: none"> <li>Matrix Algebra, Systems of linear equations, Eigen values and eigen vectors.</li> </ul>  | 12-15         |
|       | Calculus                 | 1. Higher Engineering Mathematics – B S Grewal<br>2. Advanced Engineering Mathematics – Kreyszig<br>3. Integral calculus - Shanti Narayan<br>4. Calculus – I A Maron | <ul style="list-style-type: none"> <li>Mean value theorems, Theorems of integral calculus, Evaluation of definite and improper integrals, Partial Derivatives, Maxima and minima, Multiple integrals, Fourier series. Vector identities, Directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems</li> </ul> |               |
|       | Differential Equations   | 1. Advanced Engineering Mathematics – Kreyszig<br>2. Advanced Engineering Mathematics – RK Jain & SRK Iyengar  | <ul style="list-style-type: none"> <li>First order equation (linear and nonlinear), Higher order linear differential equations with constant coefficients, Method of variation of parameters, Cauchy's and Euler's equations, Initial and boundary value problems, Partial Differential Equations and variable separable method.</li> </ul>         |               |
|       | Complex Variables        | 1. Foundations of Complex Analysis – S Ponnusamy<br>2. Advanced Engineering Mathematics – RK Jain & SRK Iyengar  | <ul style="list-style-type: none"> <li>Analytic functions, Cauchy's integral theorem and integral formula, Taylor's and Laurent' series, Residue theorem, solution integrals.</li> </ul>  |               |
|       | Probability & Statistics | 1. Mathematical Statistics – V K Kapoor<br>2. Probability - Schaum series<br>3. Probability - Gupta and Kapoor   | <ul style="list-style-type: none"> <li>Sampling theorems, Conditional probability, Mean median, mode and standard deviation, Random variables, Discrete and continuous distributions, Poisson, Normal and Binomial distribution, Correlation and regression analysis.</li> </ul>  |               |
|       | Numerical Methods        | 1. Numerical methods – Sastry<br>2. Numerical methods - Rajaraman  | <ul style="list-style-type: none"> <li>Solutions of non-linear algebraic equations, single and multi-step methods for differential equations.</li> </ul>  |               |
|       | Transform Theory         | 1. A Text of Engineering Mathematics – Ramana BV   | <ul style="list-style-type: none"> <li>Fourier transform, Laplace transform, Z-transform.</li> </ul>  |               |

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|-------|---|---|---|---------------|
| 2     | Basics of Circuits                                    | <ol style="list-style-type: none"> <li>1. Engineering Circuit Analysis – WH Hayt &amp; J Kemmerly</li> <li>2. Networks &amp; Systems – D Roy Choudary</li> <li>3. Fundamentals of Electric Circuits – Alexander Sadiku</li> <li>4. Electric Circuits – Joseph Edminister, Schaum's Outline series</li> </ol>  | <ul style="list-style-type: none"> <li>• Kirchoff's laws, mesh and nodal Analysis. Circuit theorems. One-port and two-port Network Functions.</li> </ul>  | 5-18          |
| 3     | Basics of Measurement Systems                         | <ol style="list-style-type: none"> <li>1. Principles of Measurement Systems – John P Bently</li> <li>2. Measurement Systems – Ernest Doebelin</li> </ol>  | <ul style="list-style-type: none"> <li>• Static and dynamic characteristics of Measurement Systems. Error and uncertainty analysis. Statistical analysis of data and curve fitting.</li> </ul>  | 3-5           |
| 4     | Transducers, Mechanical Measurement & Instrumentation | <ol style="list-style-type: none"> <li>1. Principles of Measurement Systems – John P Bently</li> <li>2. Instrumentation for Engineering Measurements – James W Dally</li> <li>3. Experimental Methods for Engineers – Jack Holman</li> </ol>  | <ul style="list-style-type: none"> <li>• Resistive, Capacitive, Inductive and piezoelectric transducers and their signal conditioning. Measurement of displacement, velocity and acceleration (translational and rotational), force, torque, vibration and shock. Measurement of pressure, flow, temperature and liquid level. Measurement of pH, conductivity, viscosity and humidity.</li> </ul>  | 12-18         |
| 5     | Signals Systems & Communications                      | <ol style="list-style-type: none"> <li>1. Signals Systems – Oppenheim &amp; Willsky</li> <li>2. Theory &amp; Problems of Signals and Systems – Schaum's Outline series</li> <li>3. Signal processing &amp; Linear Systems – B P Lathi</li> <li>4. Communication Systems – Simon Haykin</li> <li>5. Communication Systems: Analog &amp; Digital – Singh RP, Spare SD</li> <li>6. Modern Digital &amp; Analog Communication Systems – BP Lathi</li> <li>7. Electronic Communication Systems – K George</li> </ol> | <ul style="list-style-type: none"> <li>• Periodic and aperiodic signals. Impulse response, transfer function and frequency response of first- and second order systems. Convolution, correlation and characteristics of linear time invariant systems. Discrete time system, impulse and frequency response. Pulse transfer function. IIR and FIR filters. Amplitude and frequency modulation and demodulation. Sampling theorem, pulse code modulation. Frequency and time division multiplexing. Amplitude shift keying, frequency shift keying and pulse shift keying for digital modulation.</li> </ul> | 8-19          |
| 6     | Control Systems & Process Control                     | <ol style="list-style-type: none"> <li>1. Control Systems – I J Nagrath &amp; M Gopal</li> <li>2. Automatic Control Systems – Benjamin C Kuo</li> <li>3. Linear Control Systems – B S Manke</li> <li>4. Modern Control Engineering - Ogata</li> <li>5. Process Systems Analysis &amp; Control – Donald Coughanowr</li> <li>6. Process Control – Peter Harriott</li> </ol>   | <ul style="list-style-type: none"> <li>• Feedback principles. Signal flow graphs. Transient Response, steady-state-errors. Routh and Nyquist criteria. Bode plot, root loci. Time delay systems. Phase and gain margin. State space representation of systems. Mechanical, hydraulic and pneumatic system components. Synchro pair, servo and step motors. On-off, cascade, P, P-I, P-I-D, feed forward and derivative controller, Fuzzy controllers.</li> </ul>  | 11-14         |

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| 7     | <b>Electrical &amp; Electronic Measurements</b>           | <ol style="list-style-type: none"> <li>1. A Course in Electrical and Electronic Measurements &amp; Instrumentation – <b>Sawhney AK</b></li> <li>2. Electronic Instrumentation – <b>Kalsi HS</b></li> <li>3. Electronic Measurement &amp; Instrumentation – <b>David A Bell</b></li> <li>4. Electronic Instruments &amp; Measurements – <b>ML Anand</b></li> <li>5. Electronic Instrumentation &amp; Measurement Techniques – <b>William David cooper</b></li> </ol> | <ul style="list-style-type: none"> <li>• Bridges and potentiometers, measurement of R,L and C. Measurements of voltage, current, power, power factor and energy. A.C &amp; D.C current probes. Extension of instrument ranges. Q-meter and waveform analyzer. Digital voltmeter and multi-meter. Time, phase and frequency measurements. Cathode ray oscilloscope. Serial and parallel communication. Shielding and grounding.</li> </ul>  | <b>8-23</b>   |
| 8     | <b>Analog Electronics</b>                                 | <ol style="list-style-type: none"> <li>1. Electronic Devices &amp; Circuits – <b>Millman Jacob &amp; Halkias Christos</b></li> <li>2. Integrated Electronics - <b>Millman Jacob &amp; Halkias Christos</b></li> <li>3. Design with Opamps and Analog Integrated Circuits – <b>Sergio Franco</b></li> </ol>  | <ul style="list-style-type: none"> <li>• Characteristics of diode, BJT, JFET and MOSFET. Diode circuits. Transistors at low and high frequencies, Amplifiers, single and multi-stage. Feedback amplifiers. Operational amplifiers, characteristics and circuit configurations. Instrumentation amplifier. Precision rectifier. V-to-I and I-to-V converter. Op-Amp based active filters. Oscillators and signal generators.</li> </ul>   | <b>12-18</b>  |
| 9     | <b>Digital Electronics</b>                                | <ol style="list-style-type: none"> <li>1. Digital Design – <b>Morris Mano</b></li> <li>2. Digital Electronics and Microprocessors: Problems &amp; Solutions – <b>RP Jain</b></li> <li>3. Digital Systems: Principles &amp; Applications – <b>Tocci Ronald J, Widmer Neal S &amp; Gregory L Moss</b></li> <li>4. 8085 Architecture, Programming &amp; Applications – <b>Ramesh Gaonkar</b></li> </ol>  | <ul style="list-style-type: none"> <li>• Combinational logic circuits, minimization of Boolean functions. IC families, TTL, MOS and CMOS. Arithmetic circuits. Comparators, Schmitt trigger, timers and mono-stable multi-vibrator. Sequential circuits, flip-flops, counters, shift registers. Multiplexer, S/H circuit. Analog-to-Digital and Digital-to-Analog converters. Basics of number system.</li> <li>• Microprocessor applications, memory and input-output interfacing. Microcontrollers.</li> </ul> | <b>5-15</b>   |
| 10    | <b>Analytical, Optical and Biomedical Instrumentation</b> | <ol style="list-style-type: none"> <li>1. Hand book of analytical instruments – <b>khandpur</b></li> <li>2. Optics – <b>Ajoy Kumar Ghatak</b></li> <li>3. Biomedical Instruments &amp; Measurements – <b>Cromwell</b></li> <li>4. Medical Instrumentation Application &amp; Design – <b>John G Webster</b></li> <li>5. Introduction to Biomedical Equipment Technology – <b>Joseph J. Carr</b></li> </ol>   | <ul style="list-style-type: none"> <li>• Mass spectrometry. UV, visible and IR spectrometry. X-ray and nuclear radiation measurements. Optical sources and detectors, LED, laser, Photo-diode, photo-resistor and their characteristics. Interferometers, applications in metrology. Basics of fiber optics. Biomedical instruments, EEG, ECG and EMG. Clinical measurements. Ultrasonic transducers and Ultrasonography. Principles of Computer Assisted Tomography.</li> </ul>                                 | <b>7-15</b>   |

**Note:** Analysis is made on the basis of previous GATE Papers

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**Examination Type:**

GATE Examination consists of a single paper of **3 Hours** duration, which contains **65 Questions** carrying a maximum of **100 Marks**. The Question paper will consist of only multiple choice objective questions

| Paper Code                    | Patterns of Question papers   | Negative Marks for wrong Answer  |
|-------------------------------|---|--|
| <b>CS, EC, EE, IN, CE, ME</b> | Q.1 to Q.25: <i>Will carry one mark each</i> (sub-total 25 marks).  | $\frac{1}{3}$ mark will be deducted for each wrong answer.   |
|                               | Q.26 to Q.55: <i>Will carry two marks each</i> (sub-total 60 marks)   | $\frac{2}{3}$ mark will be deducted for each wrong answer.   |
|                               | Q.48 through Q.51 (2 pairs) will be <u>common data questions</u> . <i>Each question will carry two marks</i>  | $\frac{2}{3}$ mark will be deducted for each wrong answer.   |
|                               | Question pairs (Q.52, Q.53) and (Q.54, Q.55) will be <u>linked answer questions</u> .<br>The answer to the second question of the last two pairs will depend on the answer to the first question of the pair.<br>If the first question in the linked pair is wrongly answered or is un-attempted, then the answer to the second question in the pair will not be evaluated. <i>Each question will carry two marks</i> | There will be negative marks only for wrong answer to the first question of the linked answer question pair i.e. for Q.52 and Q.54, $\frac{2}{3}$ mark will be deducted for each wrong answer. There is no negative marking for Q.53 and Q.55. |
|                               | Q.56 to Q.60 : From General Aptitude (GA) <i>will carry one mark each</i> (sub-total 5 marks).  | $\frac{1}{3}$ mark will be deducted for each wrong answer.   |
|                               | Q.61 to Q.65 : From GA <i>will carry two marks each</i> (sub-total 10 marks)  | $\frac{2}{3}$ mark will be deducted for each wrong answer.   |
|                               | All the papers bearing the codes CS, EC, EE, IN, CE, ME will contain few questions on Engineering Mathematics carrying 15 marks.  |  |

**Note:** GATE 2012 score is valid for **2 YEARS** from the date of announcement of the GATE 2012 results.

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