# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)


## Competitive Examinations Preparation (CEP): (Extra credits=2)

**Salient Features of CEP:**

- It is optional module
- Motivation, mentoring and preparation of students to pursue higher education
- Modules as per national level technical competitive examination **GATE**
- Motivation, mentoring and preparation of students to join public sector or government organizations like BARC, DRDO etc.
- Motivation, mentoring and preparation of students to join top ranking technical institutes in country like IISc and IIT.
- Module design as per the courses studies in that semester or prior semester by considering syllabus of GATE examination
- Help to sharpen the problem solving skills of students and concerned teachers
- Course mentors will be allotted at the start of academic year
- Two (2) extra credits will be given if
    1. Student submit **Valid Gate Score card**.
    2. Must pass CEP1 to CEP6 in modal question papers given by the faculty
    3. Maintains regular contact with CEP course teachers

**CEP Courses:**

**Semester III:**
**CEP1: Introduction to CEP**

One hour introduction session to entire class about CEP.

Student shall be assigned as 'Teaching Assistant' to Engineering Mathematics Course –I.
Student shall maintain regular contact with the semester III course teachers (once in a week per course). Teacher shall maintain the attendance of the student. Teacher shall mentor student and give assignments with GATE level problems to solve. At least TWO assignments per course shall be submitted by the student.

After End Semester Examination student shall appear for the Model Test paper based on the pattern of the actual GATE Examination. This paper shall be based on the contents of Semester-I and Semester-III courses. The negative marking is applicable as per GATE pattern.
The student shall obtain minimum 10 marks to continue registration in CEP module for next semester onwards.

**Semester IV:**
**CEP2: Problem solving module-I**

Student shall be assigned as 'Teaching Assistant' to Engineering Mathematics Course–II and Basics of electrical Engineering.
Student shall maintain regular contact with the semester IV course teachers (once in a week per course). Teacher shall maintain the attendance of the student. Teacher shall mentor student and give assignments with GATE level problems to solve. At least TWO assignments per course shall be submitted by the student.

After End Semester Examination student shall appear for the Model Test paper based on the pattern of the actual GATE Examination. This paper shall be based on the contents of Semester-II and Semester-IV courses. The negative marking is applicable as per GATE pattern.
The student shall obtain minimum 10 marks to continue registration in CEP module for next semester onwards.

**Semester V:**
**CEP3: Problem solving module-II**

Student shall be assigned as 'Teaching Assistant' to Semester III courses.
Student shall maintain regular contact with the semester V course teachers (once in a week per course). Teacher shall maintain the attendance of the student. Teacher shall mentor student and give assignments with GATE level problems to solve. At least TWO assignments per course shall be submitted by the student.

After End Semester Examination student shall appear for the Model Test paper based on the pattern of the actual GATE Examination. This paper shall be based on the contents of Semester-V courses. The negative marking is applicable as per GATE pattern.
The student shall obtain minimum 10 marks to continue registration in CEP module for next semester onwards.

**Semester VI:**
**CEP4: Problem solving module –III**

Student shall be assigned as 'Teaching Assistant' to Semester IV courses.

Self Learning: Numerical Ability and Verbal Ability

Student shall maintain regular contact with the semester VI course teachers (once in a week per course). Teacher shall maintain the attendance of the student. Teacher shall mentor student and give assignments with GATE level problems to solve. At least TWO assignments per course shall be submitted by the student.

After End Semester Examination student shall appear for the Model Test paper based on the pattern of the actual GATE Examination. This paper shall be based on the contents of Semester VI courses and self learning module on numerical ability and verbal ability. The negative marking is applicable as per GATE pattern.
The student shall obtain minimum 10 marks to continue registration in CEP module for next semester onwards.

**Semester VII:**
**CEP5: Problem solving module-IV**

Student shall be assigned as 'Teaching Assistant' to Semester V courses.

Self Learning: Contents not covered in any semester of study

Student shall maintain regular contact with the semester VII course teachers (once in a week per course).Teacher shall maintain the attendance of the student. Teacher shall mentor student and give assignments with GATE level problems to solve.
At least TWO assignments per course shall be submitted by the student.

After End Semester Examination student shall appear for the Model Test paper based on the pattern of the actual GATE Examination. This paper shall be based on the contents of entire syllabus of GATE Examination. The negative marking is applicable as per GATE pattern.
The student shall obtain minimum 10 marks to continue registration in CEP module for next semester onwards.

**Semester VIII:**
**CEP6: Problem solving module-V**

At the start of the semester student shall appear for the TWO Model Test papers based on the pattern of the actual GATE Examination. This paper shall be based on the contents of entire syllabus of GATE Examination. The negative marking is applicable as per GATE pattern.

**Student shall submit 'Valid GATE Score Card' after declaration of GATE result.**

# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

# Mapping with Syllabus for GATE Exam (Semester wise)

| |
|---|
| **Semester - I** |
| **Engineering Mathematics-I :** basis, linear dependence and independence, matrix algebra, eigen values and eigen vectors, rank, solution of linear equations – existence and uniqueness. partial derivatives, maxima and minima, Taylor series, Vectors in plane and space, vector operations, gradient, divergence and curl, |
| |
| **Semester-II** |
| **Engineering mathematics –II:** multiple integrals, Differential Equations: First order equations (linear and nonlinear), higher order linear differential equations, Cauchy's and Euler's equations, methods of solution using variation of parameters, complementary function and particular integral, partial differential equations, variable separable method, initial and boundary value problems. single and multi-step methods for differential equations |
| **Basics of Electrical Engineering :** Network solution methods: nodal and mesh analysis; Network theorems: superposition, Thevenin and Norton's, maximum power transfer; Wye- Delta transformation; Steady state sinusoidal analysis using phasors |
| |
| **Semester-III** |
| **Applied Mathematics-I:** Gauss's, Green's and Stoke's theorems, Cauchy's integral theorem, Cauchy's integral formula; Taylor's and Laurent's series, residue theorem. |
| **Circuit Theory:** Network solution methods: nodal and mesh analysis; Network theorems: superposition, Thevenin and Norton's, maximum power transfer; Wye- Delta transformation; Steady state sinusoidal analysis using phasors;<br>Time domain analysis of simple linear circuits; Solution of network equations using Laplace transform; Frequency domain analysis of RLC circuits;<br>Linear 2- port network parameters: driving point and transfer functions; State equations for networks |
| **Electronics Devices and Circuits:** Energy bands in intrinsic and extrinsic silicon; Carrier transport: diffusion current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equations; P-N junction, Zener diode, BJT, MOS capacitor, MOSFET.<br>Small signal equivalent circuits of diodes, BJTs and MOSFETs; Simple diode circuits: clipping, clamping and rectifiers; Single-stage BJT amplifiers, MOSFET amplifiers: biasing, bias stability, mid-frequency small signal analysis and frequency response; BJT and MOSFET amplifiers: multi-stage, differential, feedback. |
| **Digital Circuits:** Number systems; Combinatorial circuits: Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexers, decoders and PLAs; Sequential circuits: latches and flip- flops, counters, shift- registers and finite state machines; |
| **Signals and Systems:** Fourier series and Fourier transform representations, sampling theorem and applications; Discrete-time signals: discrete-time Fourier transform (DTFT), DFT, FFT, Z- |

| |
|---|
| transform, interpolation of discrete-time signals; LTI systems: definition and properties, causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay. |
| |
| **Semester-IV** |
| **Applied Mathematics-II:** line, surface and volume integrals, Analytic functions, Mean, median, mode and standard deviation, probability distribution functions - binomial, Poisson, exponential and normal; Joint and conditional probability |
| **Fundamentals of Communication Engineering:** Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers, circuits for analog communications; |
| **Electromagnetic Wave Propagation**: Electrostatics; Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector; Plane waves and properties:<br>reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth; Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart; |
| **Principles of Control System:** Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems;<br>Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems. |
| **Integrated Circuits:** power circuits, Sinusoidal oscillators: criterion for oscillation, Simple op-amp circuits; Active filters; single-transistor and op-amp configurations; Function generators, wave-shaping circuits and 555 timers; Voltage reference circuits; Power supplies: ripple removal and regulation.<br>Data converters: sample and hold circuits, ADCs and DACs; |
| |
| **Semester V:** |
| **Microcontroller and Applications:** 8-bit microprocessor (8085): architecture, programming, memory and I/O interfacing.<br>Data converters: sample and hold circuits, ADCs and DACs; |
| **Random Signal Analysis:** Random processes: autocorrelation and power spectral density, properties of white noise; Information theory: entropy, mutual information and channel capacity theorem; |
| |
| **Semester VI:** |
| **Digital Communication:** Random processes: autocorrelation and power spectral density, properties of white noise; Information theory: entropy, mutual information and channel capacity theorem;<br>Digital communications: PCM, DPCM, digital modulation schemes, amplitude, phase and |

| |
|---|
| frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation; Fundamentals of error correction, Hamming codes; inter-symbol interference and its mitigation; Basics of TDMA, FDMA and CDMA, filtering of random signals through LTI systems; |
| **Discrete Time Signal Processing:** Discrete-time signals: discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals , digital filter design techniques. |
| **VLSI Design:** Integrated circuit fabrication process: oxidation, diffusion, ion implantation, photolithography and twin-tub CMOS process. |
| |
| **Semester VII:** |
| **Microwave and Radar Engineering :** Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations;<br>Antennas: antenna types, radiation pattern, gain and directivity, return loss, antenna arrays;<br>Basics of radar; Light propagation in optical fibers. |
| |
| **Not covered in any Semester** |
| **Engineering Mathematics:** Linear Algebra: Vector space<br>Calculus: Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals<br>Solution of nonlinear equations, convergence criteria.<br>Combinatorial probability<br>Correlation and regression analysis |
| Semiconductor memories: ROM, SRAM, DRAM; |
| Timing and frequency synchronization. |

# Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)


## Self Learning Module: General Aptitude

### I. Verbal Ability

1. Grammar
2. Nouns, Pronouns, Articles
3. Verbs, Auxiliaries, Modals
4. Adjectives, Adverbs
5. Prepositions, Conjunctions
6. Active/ Passive Voice, Direct/ Indirect Speech
7. Verbal phrases
8. Sentence Completion
9. Vocabulary
10. Synonyms
11. Antonyms
12. Analogy
13. Reverse Analogy
14. Verbal Reasoning
15. Critical Reasoning
16. Logical Reasoning

### II. Numerical Ability

#### I. Quantitative Aptitude:

1. Simple Equations
2. Ratio-proportion-variation
3. Numbers
4. Percentage, Profit and Loss
5. Simple Interest and Compound Interest
6. Average, mixtures and Alligations
7. Time and Work
8. Time and Distance
9. Indices, Surds, Logarithms
10. Quadratic Equations
11. Inequalities
12. Progressions
13. Permutations and Combinations
14. Data Interpretation

#### II. Reasoning

1. Number and Letter Series
2. Analogies
3. Odd man out (Classification)
4. Coding and Decoding
5. Blood relations
6. Venn Diagrams
7. Seating Arrangements
8. Puzzles
9. Clocks and Calendars