

**SRI SIDDHARTHA UNIVERSITY,
TUMKUR**

Aptitude Test

Syllabii

For Ph.D/M.Sc.(Engg)

Programmes

SRI SIDDHARTHA UNIVERSITY, TUMKUR

SCHEME OF APTITUDE TEST

For Ph.D/M.Sc. (Engg)

For Faculty of Engineering & General Science

Common to:

Civil Engineering Science / Mechanical Engineering Science /
Electrical Engineering Science / Computer Sciences / Textile / Silk
Engineering / Chemical Engineering / Polymer Science / Bio -Tech/
Architecture / Physics / Chemistry / Mathematics & M.Sc. (Engg)

Part I: Mathematics Section

Questions carrying one mark - 30 questions
(Objective/multiple choice, covering full syllabus)

Part II: Discipline Oriented Section

Questions carrying one marks - 50 questions
(Objective/multiple choice, preferably involving numericals
covering full syllabus)

Part III : Aptitude section

Reading Comprehension data Sufficiency & Data - 20 questions
Interpretation, Logical Reasoning computer awareness

TOTAL 100 marks

SRI SIDDHARTHA UNIVERSITY, TUMKUR

Topics of Syllabus for the Qualifying Exam for the Ph.D. Programme Syllabus for the Technical Aptitude Test

For Faculty of Engineering & General Science

Part I: Mathematics Section

Questions carrying one mark
(Objective/multiple choice, covering full syllabus)

- 30 questions

Common to:

Civil Engineering Science / Mechanical Engineering Science / Electrical Engineering Science / Computer Sciences / Physics / Chemistry / Mathematics & M.Sc (Engg)

SYLLABUS IN MATHEMATICS

1. Matrices : Definition, Rank of matrix Systems of m linear equations with n unknown, Eigen value and eigen vectors of a square matrix.
2. Calculus
 - a) Differential Calculus : Limits and Continuity , Differentiation and its applications, Partial Derivatives. (Basic)
 - b) Integral Calculus : Reduction formulae, Definite Integrals, Properties and Multiple Integrals,
3. Vector Algebra; Complex numbers; Definitions, Vector products , Properties; Amplitude & Modules of a complex number, De Moivre's theorem and examples.
4. Applied Mathematics - Laplace Transforms (Elementary transformation), Fourier series, (Basics definition and examples.) , half range Fourier series and harmonic analysis.
5. Numerical Analysis – Numerical Solutions of Algebraic and transcendental equations, Finite differences , Interpolation (For equal and unequal intervals) Numerical solutions of first order differential equations , Numerical Integration
6. Statistics and Probability
Measures of central tendency and dispersion curve fitting by least square methods . Correlation and regression. analysis
Probability : Axioms , conditional probability, probability distribution -Binomial poisson and normal distribution

TEXT BOOKS:

1. Higher Engineering Mathematics – Dr. B.S. Grewal (37th Edition)
2. Elementary Engineering Mathematics - Dr. B. S. Grewal
3. Advanced Engineering Mathematics –Erwin Kreyszig
4. Introduction to Numerical Analysis –S.S. Sastry

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Topics of Syllabus for the Qualifying Exam for the Ph.D. Programme
Syllabus for the Technical Aptitude Test

For Faculty of Engineering & General Science

Part III: Aptitude section

Questions carrying one mark

- 20 questions

(Objective/multiple choice, covering full syllabus)

Common to:

Civil Engineering Science / Mechanical Engineering Science / Electrical Engineering Science / Computer Sciences / Textile / Silk Engineering / Chemical Engineering / Polymer Science / Bio –Tech / Architecture / Physics / Chemistry / Mathematics & M.Sc (Engg)

Syllabus in Aptitude section

Reading Comprehension data Sufficiency & Data Interpretation, Logical Reasoning & Computer awareness

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Part II: Discipline Oriented Section

- 50 questions

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CIVIL ENGINEERING SCIENCE

Structural Analysis

- Structural Systems
- Methods of Joints and Sections and Truss
- Analysis Strain Energy
- Arches and Cables

Fluid Mechanics

- Open Channel Flow
- Water Hammer
- Dimensional Analysis
- Impact of Jets on Vanes Turbines
- Centrifugal Pumps

Concrete Technology

- Fresh Concrete and Hardened Concrete Mix Design
- Special Concretes
- Non-destructive Testing of Concrete

Design of Concrete Structures

- Principles of Limit State Design Serviceability Limits
- Effective Lengths
- Design Loads
- Anchorage of Bars
- Lateral Stability of Beams

Geotech

- Index Properties of Soil
- Classification of Soils Soil Structures
- Compaction of Soil
- Consolidation of Soils
- Shear Strength of Soil

Transportation

- Highway Planning and Alignment

Design Principles
Pavement Materials and Construction
Wind Analysis and Site Selection for Airports

Irrigation Engineering

Water Requirements of Crops
Canals, Diversion Works,
Gravity and Earthen Dams

Steel Structures

Steel Structural Fasteners
Tension – Compression – Flexure
Members Connections

Theory of Elasticity

Plane Stresses and Plane Strain
Principal Stresses and Principal Strains
Strain Displacement Relationship
Equilibrium and Boundary
Condition Generalised Hook's Law

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Mechanical Engg. Science

(IP/IEM/Auto/ME/ & Other Allied branches)

I. Prime movers (I. C. Engine)

Classification of I. C Engines - 2 Stroke & 4 Stroke Petrol & Diesel

Engines. Concept of Mechanical efficiency BHP & IHP Laws of Ist & IInd

Thermodynamics, zeroth Law, applications.

II. Refrigeration & Air -conditioning – properties – COP unit of Refrigeration,

Refrigeration effect, Tonne Refrigeration.

III. Manufacturing Process part of a lathe, operation in a lathe, Types of Drilling

Machine, operation a Drilling machine.

Types of milling machines, operation on milling machines

Grinding machines, bonding materials, grinding terminology. Type of grinding machine,

Soldering,

brazing & welding classification & types. Lubrication & bearing types.

IV Power transmission & mechatronics

Belt drives, gear drives,

Introduction to mechanics - open loop & closed loop control System

Advantages & Disadvantages.

V Heat treatment of Metals -Annealing, Normalizing hardening,

tempering, carburizing, cyaniding, Nitriding

and flame hardening, Iron, Carbon equilibrium diagram.

Composite Materials – Types of matrix materials, FRP & MMC

advantages & applications.

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Electrical Sciences

(ECE/EEE/IT/TC/BM/ML and other allied branches)

1. Fundamentals & AC Circuits Network Theorems.
2. Electrical Machines AC & DC, Transformers
3. Diode Circuits – Amplifiers, op – Amp Applications.
4. Simplification of Boolean Expressions – karnaugh maps combinational logic Design.
5. Sequential logic circuits – Flip flops & counters, shift Registers
6. Time response of second order control systems nyquist criteria – Bode plots, phase & gain margins.
7. Thyrestors – Choppers & Inverters.
8. Field Theory – Electric & magnetic fields, max wells equations.
9. Microprocessors – Architecture, operation, programming and interfacing
10. Transducers.

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Computer Sciences (CSE/ISE/MCA)

1.	Discrete Mathematical Structures (Set Memory Fundamentals of Logic, Relations functions)
2.	Computer Organization (as per CSE46 Syllabus)
3.	Data Structures using C (Stack, recursion, Queues and lists, Trees, sorting, searching)
4.	Operating systems (as per CS 52 Syllabus)
5.	OOP with C++ (as per CSE 36 Syllabus)
6.	DBMS (as per CS53 Syllabus)
7.	Analysis & Design of Algorithms (as per CSE 43 Syllabus)
8.	object oriented Analysis & design (as per CS 72 Syllabus)
9.	Software Engg. (Overview, Requirements Engg, Software Design, verification & Validation)

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CHEMISTRY

(Topics Studied up to the Bachelor Degree Level should be considered for setting the comprehensive questions in the subject)

1. Periodic Properties - Atomic radii – Ionization energy in groups and periods – Electron affinity Chemical Bonding.
2. Organic Chemistry – Classification and nomenclature of organic compounds. Electronic effects and reactive intermediates –Principles of purification of organic compounds – Halogens – Cycloalkanes – Aromatic hydrocarbons – Elimination Reaction – Organo-metallic compounds – Alcohols – Phenols – Carboxyl compounds – Carboxylic acid – Hydroxy acids – Amines – Diazonium Compounds. Active methyl compounds –Carbohydrates – Stereo-chemistry – Amino acids – Peptides – proteins. Oils and Fats – Waxes – Dyes – Terpenes. Drugs - Hormones – Vitamins -
3. Inorganic Chemistry – Molecular orbital theory – General characteristics of s – block and p. block - elements - Gravimetry – Statistical analysis of results of quantitative measurements (errors – accuracy – precession etc). Nobel Gases – Non-aqueous solvents - Ion exchange - Metallurgy – Gaseous fuels.
4. Physical Chemistry - Liquid mixtures - Properties of liquid Mixtures – Colligative Properties - Chemical Kinetics – Colloids – Emulsions – Crystallography. Electrochemistry – Hydrolysis of salts – Ionic equilibria. Distribution law.
5. Nuclear chemistry - Fundamental properties of nucleons – isotopes – nuclear stability – binding energy – nuclear models – fission and fusion – nuclear transmutation – radioactivity – nuclear reactors – accelerators. Application of nuclear chemistry.
6. Thermodynamics – Gas laws - Thermodynamic processes – State function – Laws of Thermodynamics - Heat engine - Free energy – Entropy – Phase equilibria.
7. Co-ordination Chemistry – Basic concepts – Valence bond theory – Crystal field theory – Bio-inorganic chemistry – Enzymes – Occurrence – properties and structure of enzymes.
8. Radiation Chemistry - Primary and secondary states in radiochemical reactions. Ionic yield – energy yield – comparison with photochemistry – Radiolysis – Units of Measurement of radiation.
9. Molecular Chemistry – Types of spectra – Rotational energy – Calculation of bond length – Vibrational energy - Selection rules and transitions. NMR Spectroscopy.
10. Polymer Chemistry – Inorganic polymers – Properties – Glass transition temperature.

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Physics

(Topics Studied up to the Bachelor Degree Level should be considered for setting the comprehensive questions in the subject)

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1. Mechanics and Properties of Matter - Frames of Reference – Rigid body dynamics – Moment of Inertia – Laws of Conservation. Elasticity – Viscosity – Surface Tension.
2. Heat and Thermodynamics – Kinetic Theory – Laws of Radiation – Thermodynamics – Liquefaction of Gases – Entropy – Heat engines and Refrigeration. Thermal Conductivity.
3. Waves Acoustics – Progressive waves – Superposition – Doppler effect – Acoustics of Buildings – Fourier transforms – Ultrasonics.
4. Optics - Theories of Light – Interference – Diffraction – Polarisation – Optical Instruments – Resolving Power. Laser – Production, Properties and Applications.
5. Electricity and Magnetism – Electrostatics – Galvanometers - Measuring Instruments) - Alternating and Direct current – Generation and Analysis – Thermoelectricity – Electromagnetism .
6. Atomic and Molecular Physics – The electron – Atomic Models – Atomic spectra – Molecular spectra – Related measurements. Zeeman effect. X – rays – Crystallography.
7. Nuclear Physics – The nucleus – Nuclear models - Mass spectrographs – Radioactivity – Accelerators – Nuclear detectors – Nuclear reactions - Cosmic ray - Mossbauer effect – Magnetic Resonance – Applications – Elementary Particles.
8. Solid State Physics - Relativity - Special and General Theories of relativity – Statistical Physics – Specific Heats of Solids – Band Theory of solids – Classification of solids - Electrical Conductivity in solids – Dielectric and Magnetic Properties – Specific Heats of Solids – Semiconductors – Applications – Semiconductor devices – Transistors - Amplifiers – Oscillators - Digital electronics – Superconductivity.
9. Quantum Physics – Failure of Classical Physics – Duality – Wave function – Schrodinger wave equations. Solutions – Eigen values.
10. Recent Trends in Physics – Liquid Crystals – Optical Fibers – Smart Materials – Nano-Materials.

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For Faculty General Science

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MATHEMATICS

(FOR BACKGROUND OF M.SC.(MATHS))

(Topics Studied up to the Bachelor Degree Level should be considered for setting the comprehensive questions in the subject)

1. TRIGONOMETRY

Trigonometric ratios and relations, simple problems. Complex numbers: Definition and properties, De Moivre's theorem, roots of complex numbers

2. INFINITE SERIES

Convergence and divergence of series of positive terms. Standard tests for convergence. Alternating series, Leibnitz test.

3. LINEAR ALGEBRA

Matrices and determinants, Inverse of a matrix, rank of a matrix, consistency of a system of linear equations. Eigen values and eigen vectors

4. CALCULUS

- a) DIFFERENTIAL CALCULUS: n^{th} derivative of standard functions, polar curves, angle between polar curves. Partial differentiation, maximum and minimum for function of single and two variables. Curvature and radius of curvature, mean value theorems, Taylor's and Maclaurin's expansion for a function of single variable. Indeterminate forms.

b) INTEGRAL CALCULUS

Tracing of standard curves. Beta and gamma functions. Length, Area , Volume using multiple integrals.

5. DIFFERENTIAL EQUATIONS

Solutions of first order and first degree differential equations,

6. APPLIED MATHEMATICS

a) Laplace Transforms, Fourier Series & Fourier Transforms

b) NUMERICAL METHODS

Solutions of algebraic and transcendental equations, finite differences and related problems, numerical differentiation and numerical integration , Numerical solution of ordinary and partial differential equations, application to Engineering problems.

c) STATISTICS AND PROBABILITY

Correlation and regression, analysis of variance.

Probability : Axioms , Including Bayes theorem, conditional probability, probability distribution -Binomial poisson, normal, geometric and exponential distribution.

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