Syllabus for ISRO Exam

ISRO Scientist/Engineer Syllabus

- **ISRO Scientist/ Engineer Syllabus – Civil Engineering**
  - Building Materials.
  - Transportation Engineering.
  - Soil Mechanics.
  - Irrigation Engineering.
  - Environmental Engineering.
  - Structural Engineering
  - Theory of Structures.
  - RCC Design
  - Steel Design.
  - Concrete Technology.

- **ISRO Scientist/ Engineer Syllabus – Electrical Engineering**
  - Basic concepts.
  - Circuit law.
  - AC Fundamentals.
  - Basic Electronics.
  - Measurement and Measuring Instruments.
  - Electrical Machines.
  - Fractional Kilowatt Motors.
  - Single phase induction Motors.
  - Synchronous Machines.
  - Magnetic Circuit.
  - Transmission and Distribution.
  - Estimation and Costing.
  - Utilization and Electrical Energy.

- **ISRO Scientist/ Engineer Syllabus – Electronics and Communication**
- Digital Electronics.
- Analytical, Optical Instrumentation.
- Analog Electronics.
- Electrical and Electronic Measurements.
- Transducers, Mechanical Measurement and Industrial Instrumentation.
- Control Systems and Process Control.
- Signals, Systems, and Communications.

- **ISRO Scientist/ Engineer Syllabus – Mechanical Engineering**
  - Heat Engines.
  - The strength of Materials.
  - Structural Engineering.
  - Fluid Mechanics.
  - Automobile Engineering.
  - Theory of Machines.
  - Manufacturing Technology.
  - Industrial Engineering & Management etc.

- **ISRO Scientist/ Engineer Syllabus – Computer Science**
  - Computer Organization and Architecture.
  - Operating System.
  - Compiler Design.
  - Web technologies.
  - Information Systems and Software Engineering.
  - Computer Networks.
  - Theory of Computation.

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**ISRO Syllabus for Driver**

- **Vehicle Act**
  - Control of Traffic
  - Offence
  - Penalty
- Accident Claims Tribunals
- Insurance of Motor Vehicles
- Licensing of Drivers of Motor Vehicles
- Various Sections of the Motor Vehicles Act, 1939
- Registration of Motor Vehicles
- Control of Transport Vehicles
- Mandatory signs
- Accident Claims
- Procedure

• **English**
  - Phrases
  - Use of correct verbs
  - Antonyms & Synonyms
  - Fill in the blanks
  - Choosing appropriate words

• **Arithmetic Ability**
  - Addition
  - Subtraction
  - Multiplication
  - Division
  - Percentage
  - Ratio
  - Average

• **General Knowledge**
  - ‘Who’ is ‘Who’
  - Capitals in India
  - Geography of India
  - Current affairs
  - The States of India

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*ISRO Assistant/Upper Division Clerk Syllabus*
• **General English**
  o Fill in the blanks.
  o Grammar
  o Vocabulary
  o Antonyms
  o One word substitutions.
  o Detecting Mis-spelt words.
  o Verbal Comprehension passage etc.
  o Idioms and phrases.
  o Sentence structure.
  o Synonyms/ Antonyms.
  o Spot the error.

• **General Studies**
  o History, Economics, Civics, and Geography.
  o Physical Science.
  o Natural Science.
  o Bifurcation of Andhra Pradesh and its Administrative.
  o Sustainable Development and Environmental Protection.
  o Current Affairs, Current Events of National & International Importance.
  o Reasoning and Analytical Ability.
  o Basic things about disaster management (CBSE- VIII & IX Standard).
  o Economic, Social, Cultural, Political, and legal implications/problems.

• **General Knowledge**
  o Current Affairs.
  o Top Events.
  o Important Rivers.
  o Important Schemes for Development.
  o Tourism Places.
  o Pilgrimage Places.
- **Arithmetic**
  - Time & Distance.
  - Tables & Graphs etc. of 10th Level.
  - C.M & H.C.F.
  - Time & Work.
  - Number Systems.
  - Ratio and Proportion.
  - Simple & Compound Interest.
  - Profit & Loss.

- **Computer Literacy**
  - Concepts of E-Governance including E-Mail, E-Commerce, the Internet, Computer Viruses.
  - Computer Applications and Basics of DOS, WINDOWS, UNIX, DB Management, DTP.
  - S-Office (Word, Excel, PowerPoint Etc.)

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**ISRO Accounts Officer Syllabus**

- General Science.
- India’s history.
- World Geography.
- Indian National Movement.
- Indian Polity.
- Economy and Culture.
- Commerce and Trade & Population.
- Ecology and urbanization.
- India’s Geological & Natural Resources.
- The current national, international main events.
- Uttar Pradesh with special knowledge.
- Indian agriculture.
- Education, culture, agriculture, industry and trade, Living & social traditions, etc.

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**ISRO Administrative Officer Syllabus**

- NonVerbal series.
- Semantic similarity.
- Coding and Decoding.
- Similarities and differences.
- Related concepts.
- Visualization of the space.
- Classification of the Figurative.
- Arithmetic Reasoning.
- The number of arithmetic series.
- Symbolic/ no classification.

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**ISRO Assistant Syllabus**

- General English
  - Direct/Indirect Speech.
  - Subject-Verb Agreement.
  - Active & Passive Voice.
  - Transformation of Sentences.
  - Fill in the Blanks.
  - Sentence Rearrangement.
  - Idioms & Phrases.
  - Unseen Passages.
  - Antonyms
- General Intelligence & Reasoning
  - Problem Solving.
- Spatial Orientation.
- Visual Memory.
- Space Visualization.
- Relationship Concepts.
- Figural Classification.
- Decision Making.
- Coding and Decoding.
- Arithmetic Number Series.
- Arithmetical Reasoning.
- Statement Conclusion etc.

- General Awareness
  - History – India & World.
  - Cultural Heritage.
  - Indian National Movement.
  - Geography – India & World.
  - About India.
  - Indian Constitution.
  - General Policy.
  - Science & Technology.
  - Current Affairs – National & International etc.

- Arithmetic
  - Number Systems.
  - Decimals & Fractions.
  - Whole Numbers.
  - Fundamental Arithmetical Operations.
  - Mixtures & Allegations.
  - Profit & Loss.
  - Time and Distance.
  - Time & Work.
  - Data Interpretation etc.
ISRO  Stenographer Syllabus for Computer Literacy

- Computer Fundamentals.
- Operating System.
- MS Excel – Spread Sheets.
- Computer Software.
- MS Word – Word Processing.
- MS Power-Point – Presentation.
- Internet Usage etc.

Syllabus for The Physics section:

Physical Electronics, Electron Devices and ICs:

- Electrons and holes in semiconductors, Carner Statistics,
  Mechanism of current flow in a semiconductor, Hall effect
- Junction theory
- Different types of diodes and their characteristics
- Bipolar Junction transistor
- Field effect transistors
- Power switching devices like SCRs, GTOs, power MOSFETs
- Basics of ICs-bipolar, MOS and CMOS types
- basic and Opto Electronics.

Signals and Systems:

- Classification of signals and systems
- System modelling in terms of differential and difference equations
- State variable representation
- Fourier series
- Fourier transforms and their application to system analysis
- Laplace transforms and their application to system analysis
- Convolution and superposition integrals and their applications
- Z-transforms and their applications to the analysis and characterization of discrete time systems
- Random signals and probability
- Correlation functions
- Spectral density
- Response of linear system to random inputs.

**Network Theory:**

- Network analysis techniques
- Network theorems, transient response, steady-state sinusoidal response
- Network graphs and their applications in network analysis
- Tellegen’s theorem
- Two port networks; Z, Y, h and transmission parameters
- Combination of two ports, analysis of common two ports
- Network functions: parts of network functions, obtaining a network function from a given part
- Transmission criteria: delay and rise time, Elmore's and other definitions effect of cascading
- Elements of network synthesis.

**Electromagnetic Theory:**

- Analysis of electrostatic and magneto-static fields
- Laplace's and Poisson's equations
- Boundary value problems and their solutions
- Maxwell's equations
- application to wave propagation in bounded and unbounded media
- Transmission lines: basic theory, standing waves, matching applications, microstrip lines
- Basics of waveguides and resonators
- Elements of antenna theory.
**Analog Electronic Circuits:**
- Transistor biasing and stabilization
- Small signal analysis
- Power amplifiers
- Frequency response
- Wide banding techniques
- Feedback amplifiers
- Tuned amplifiers
- Oscillators, Rectifiers and power supplies
- Op Amp, PLL, other linear integrated circuits and applications
- Pulse shaping circuits and waveform generators.

**Digital Electronic Circuits:**
- Transistor as a switching element
- Boolean algebra, simplification of Boolean function Karnaugh map and applications
- IC Logic gates and their characteristics
- **IC logic families:** DTL, TTL, ECL, NMOS, PMOS and CMOS gates and their comparison
- Combinational logic circuits
- Half adder, Full adder
- Digital comparator
- Multiplexer De-multiplexer
- ROM and their applications
- Flip-flops. R-S, J-K, D and T flip-tops
- Different types of counters and registers
- Waveform generators
- A/D and D/A converters
- Semi-conductor memories.

**Control Systems:**
• Transient and steady state response of control systems
• Effect of feedback on stability and sensitivity
• Root locus techniques
• Frequency response analysis
• Concepts of gain and phase margins
• Constant-M and Constant-N Nichol's Chart
• Approximation of transient response from Constant-N Nichol's Chart
• Approximation of transient response from closed loop frequency response.
• Design of Control Systems
• Compensators
• Industrial controllers.

Communication Systems:

• Basic information theory
• Modulation and detection in analogue and digital systems
• Sampling and data reconstructions
• Quantization and coding
• Time division and frequency division multiplexing
• Equalization
• **Optical Communication**: in free space and fibre optic
• Propagation of signals at HF, VHF, UHF and microwave frequency
• Satellite Communication

Microwave Engineering:

• Microwave Tubes and solid state devices, Microwave generation and amplifiers, Waveguides and other Microwave Components and Circuits, Microstrip circuits, Microwave Antennas, Microwave Measurements, Masers, Lasers Microwave propagation. Microwave Communication Systems-terrestrial and satellite-based.
Computer Engineering:

- Number Systems. Data representation
- Programming
- Elements of a high-level programming language PASCAL/C
- Use of basic data structures
- Fundamentals of computer architecture; Processor design
- Control unit design
- Memory organization, I/O System Organization
- **Microprocessors**: Architecture and instruction set of Microprocessor's 8085 and 8086, Assembly language Programming
- Microprocessor Based system design: typical examples
- Personal computers and their typical uses.

Engineering Mathematics:

- **Linear Algebra**: Algebra of matrices, system of linear equations, eigenvalues and eigenvectors.
- **Calculus**: Taylor Series, Fourier Series, partial derivatives, total derivatives, definite and improper integrals, multiple integrals.
- **Vector Calculus**: Gradient, divergence and curl, line and surface integrals, Green, Gauss and Stoke’s theorems.
- **Differential Equations**: Linear ODEs, first order non-linear ODE's, initial and boundary value problems, Laplace transform, PDE's-Laplace, wave and diffusion equations.
- **Numerical Methods**: Solution of system of linear equations, interpolation, numerical integration, Newton-Raphson method, Runge-Kutta method.
- **Probability & Statistics**: Gaussian, Weibull distribution and their properties, method of least squares, regression analysis, analysis of variance.

Applied Mechanics and Design:
- **Engineering Mechanics**: Equivalent force systems, free-body concepts, equations of equilibrium, trusses and frames, virtual work and minimum potential energy. Kinematics and dynamics of particles and rigid bodies, impulse and momentum (linear and angular), energy methods, central force motion.

- **Strength of Materials**: Stress and strain, stress-strain relationship and elastic constants, Mohr's circle for plane stress and plane strain, shearforce and bending moment diagrams, bending and shear stresses, deflection of beams torsion of circular shafts, thin and thick cylinders, Euler's theory of columns strain energy methods, thermal stresses.

- **Theory of Machines**: Displacement, velocity and acceleration, analysis of plane mechanisms, dynamic analysis of slider-crank mechanism, planar cams and followers, gear tooth profiles, kinematics and design of gears, governors and flywheels, balancing of reciprocating and rotating.

- **Vibrations**: Free and forced vibration of single degree freedom systems, effect of damping, vibration isolation, resonance, critical speed of rotors. Design of Machine Elements: Design for static and dynamic loading, failure theories, fatigue strength; design of bolted, riveted and welded joints; design of shafts and keys; design of spur gears, rolling and sliding contact bearings; brakes and clutches; belt, ropes and chain drives.

**Fluid Mechanics and Thermal Science**:

- Fluid Mechanics: Fluid properties, fluid statics, manometry, buoyancy; Control-volume analysis of mass, momentum and energy, fluid acceleration; Differential equation of continuity and momentum; Bernoulli's equation; Viscous flow of incompressible fluids; Boundary layer, Elementary turbulent flow; Flow through pipes, head losses in pipes, bends etc.
• **Heat-Transfer:** Modes of heat transfer; One dimensional heat conduction, resistance concept, electrical analogy, unsteady heat conduction, fins; Dimensionless parameters in free and forced convective heat transfer, Various correlations for heat transfer in flow over flat plates and through pipes; Thermal boundary layer; effect of turbulence; Radiative heat transfer, black and grey surfaces, shape factors, network analysis; Heat exchanger performance, LMTD and NTU methods.

• **Thermodynamics:** Zeroth, First and Second laws of thermodynamics; Thermodynamic system and processes; Irreversibility and availability; Behaviour of ideal and real gases, Properties of pure substances, calculation of work and heat in ideal processes; Analysis of thermodynamic cycles related to energy conversion; Carnot, Rankine, Otto, Diesel, Brayton and Vapour compression cycles.

• **Power Plant Engineering:** Steam generators; Steam power cycles; Steam turbines; impulse and reaction principles, velocity diagrams, pressure and velocity compounding; Reheating and reheat factor; Condensers and feed heaters.

• **IC Engines:** Requirements and suitability of fuels in IC engines, fuel ratings, fuel-air mixture requirements; Normal combustion in SI and CI engines; Engine performance calculations.

• **Refrigeration and air-conditioning:** Refrigerant compressors, expansion devices, condensers and evaporators; Properties of moist air, psychrometric chart, basic psychometric processes.

• **Turbomachinery:** Components of gas turbines; Compression processes, Centrifugal and Axial flow compressors; Axial flow turbines elementary theory; Hydraulic turbines; Euler turbine equation; Specific speed, Pelton-wheel, Francis and Kaplan turbines; Centrifugal pumps.
Manufacturing and Industrial Engineering:

- **Engineering Materials:** Structure and properties of engineering materials and their applications, heat treatment.
- **Metal Casting:** Casting processes (expendable and non-expendable) - pattern, moulds and cores, Heating and pouring, Solidification and cooling, Gating Design, Design considerations, defects.
- **Forming Processes:** Stress-strain diagrams for ductile and brittle material, Plastic deformation and yield criteria, Fundamentals of hot and cold working processes, Bulk metal forming processes (forging, rolling, extrusion, drawing), Sheet metal working processes (punching, blanking, bending, deep drawing, coining, spinning, Load estimation using homogeneous deformation methods, Defects).
- **Processing of Powder metals:** Atomization, compaction, sintering, secondary and finishing operations. Forming and shaping of Plastics Extrusion, Injection Molding.
- **Joining Processes:** Physics of welding, Fusion and non-fusion welding processes, brazing and soldering, Adhesive bonding, Design considerations in welding, Weld quality defects.
- **Machining and Machine Tool Operations:** Mechanics of machining, Single and multi-point cutting tools, Tool geometry and materials, Tool life and wear, cutting fluids, Machinability, Economics of machining, non-traditional machining processes.
- **Metrology and Inspection:** Limits, fits and tolerances, linear and angular measurements, comparators, gauge design, interferometry, Form and finish measurement, measurement of screw threads, Alignment and testing methods. Tool Engineering: Principles of work holding, Design of jigs and fixtures.
• **Computer Integrated Manufacturing:** Basic concepts of CAD CAM and their integration tools.

• **Manufacturing Analysis:** Part-print analysis, tolerance analysis in manufacturing and assembly, time and cost analysis. Work-Study: Method study work measurement time study, work sampling, job evaluation, merit rating.

• **Production Planning and Control:** Forecasting models, aggregate production planning, master scheduling, materials requirements planning.

• **Inventory Control:** Deterministic and probabilistic models, safety stock inventory control systems.

• **Operations Research:** Linear programming, simplex and duplex method, transportation, assignment, network flow models, simple queuing models, PERT and CPM.

**Computer H/W Digital Logic:**

• Logic functions
• Minimization
• Design and Synthesis of Combinational and Sequential circuits
• Number representation and Computer Arithmetic (fixed and floating point)

**Computer Organization:**

• Machine instructions and addressing modes
• ALU and Data-path
• hardwired an micro-programmed control
• Memory interface
• I/O interface (Interrupt and DMA mode)
• Serial communication interface
• Instruction pipelining
• Cache, main and secondary storage.
Data structures:

- Notion of abstract data types
- Stack
- Queue
- List
- Set
- String
- Tree
- Binary search tree
- Heap
- Graph

Programming Methodology:

- C programming, Program control (iteration, recursion, Functions)
- Scope and Binding
- Parameter passing
- Elementary concepts of Object-oriented
- Functional and Logic Programming

Algorithms for problem-solving:

- Tree and graph traversals
- Connected components
- Spanning trees
- Shortest paths
- Hashing, Sorting, Searching
- Design techniques (Greedy, Dynamic Programming, Divide-and-conquer)

Compiler Design:

- Lexical analysis
- Parsing
• Syntax directed translation
• Runtime environment
• Code generation
• Linking (static and dynamic)

Operating Systems:

• Classical concepts (concurrency, synchronization, deadlock)
• Processes
• threads and Inter-process communication
• CPU scheduling
• Memory management
• File systems
• I/O systems

Databases:

• Relational model (ER-model, relational algebra, tuple calculus)
• Database design (integrity constraints, normal forms)
• Query languages (SQL)
• File structures (sequential files, indexing, B+ trees)
• Transactions and concurrency control

Computer Networks:

• ISO/OSI stack
• sliding window protocol
• LAN Technologies (Ethernet, Token ring)
• TCP/UDP, IP
• Basic concepts of switches, gateways, and routers.