



SWAT  
Silicon University Admission Test

2025



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## **SILICON UNIVERSITY ADMISSION TEST (SUAT)**

**SUAT-2025** is only applicable for candidates who are interested for admission in any programs of M.Tech. or Ph.D. for the admission session 2025-26.

**SUAT-2025 is not applicable for admission in  
B.Tech. / MCA / iMCA / M.Sc. programs.**

## Message from the Vice-Chancellor

Welcome to Silicon University.

At Silicon University, Odisha, we are a hub of knowledge creation. Our highly qualified faculty members, superior infrastructure and excellent facilities give us a distinct edge.

To further enhance the research ecosystem here at Silicon, post-graduate students are needed to engage with faculty members in doing state-of-the art research in various disciplines - that is where you come in.

We currently have a number of M.Tech., M.Sc. and Ph.D. scholars enrolled in various branches of Engineering and Science, and reach out to you to participate in this exciting academic journey. Whether you are interested in Computer Science, Electrical, Electronics, Instrumentation, VSLI, Embedded Electronics & IIoT, Data Science or Molecular Medicine, please consider the top-notch post-graduate programs we have to offer. We believe that we create dedicated professionals who are not only competent researchers, but also good human beings.

Come join us!



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## **SILICON UNIVERSITY ADMISSION TEST (SUAT)**

The applicant has to appear the SUAT-2025 examination for seeking admission to any programs of M.Tech./Ph.D. through the University level admission. The examination will be conducted in online mode.

There is **no** examination fee required in appearing for the entrance test.

The Application Form, Prospectus and Syllabus (of respective programs) for the test will be available online only. The admission notification will be published in the official website of the university citing all important dates and schedules.

### **1. SEAT MATRIX**

#### **1.1. M.Tech. Seat Matrix**

The details of the M.Tech. programs and intake capacity offered at Silicon University are listed below. All these programs are of two years duration. All the sanctioned seats for various programs will be filled through the University Level Counseling.

<b>SL. #</b>	<b>PROGRAMS</b>	<b>PROGRAM INTAKE</b>
1.	M.Tech. Computer Science and Engineering (CSE)	09
2.	M.Tech. Electronics and Communication Engineering (ECE)	09
3.	M.Tech. Electrical and Electronics Engineering (EEE)	09

#### **1.2. Ph.D. Opportunities**

Silicon University, offers Ph.D. programs in a wide range of areas in Engineering, Science, Humanities, Social Sciences, and allied interdisciplinary areas. The offered disciplines are Computer Science & Engineering, Electrical Engineering, Electrical & Electronics Engineering, Electronics & Communication Engineering, Electronics & Instrumentation Engineering, Mechanical Engineering, Chemistry, Economics, English, Mathematics, Management, Physics and Psychology.

### **2. ELIGIBILITY CRITERIA**

The candidate should satisfy the following minimum educational qualification if chooses to study in any of the disciplines:

### 2.1. Postgraduate Admissions

SL. #	PROGRAM	MINIMUM ELIGIBILITY CRITERIA
1.	<b>M.Tech.</b> (2 years)	<p>Candidate should have a Bachelor's Degree or equivalent in the relevant field.</p> <p>Obtained at least 50% marks (45% marks in case of candidates belonging to SC and ST category) in the qualifying Exam.</p>

### 2.2. Research Programs

SL. #	PROGRAM	MINIMUM ELIGIBILITY CRITERIA
1.	<b>Ph.D.</b> (3 years)	<p>M.E. / M. Tech. / M.Sc. (Engg.)/M.Tech. by Research (R) in relevant discipline with at least 6.5 CGPA or 60 percent marks in aggregate in both B. Tech. and M. Tech. levels from a recognized technical Institute or University in India.</p> <p>OR</p> <p>M. Sc. / M.A. / MCA / MBA / M.Com. in relevant disciplines with CGPA 6.5 or 60 per cent marks at Masters level.</p> <p>OR</p> <p>Integrated 5 years dual degree B.Tech. &amp; M.Tech. with 65% marks or equivalent CGPA in the relevant discipline.</p> <p>OR</p> <p>B.E. / B.Tech. with 75% marks in aggregate or its equivalent grade on a 10-point scale.</p>

### 3. PROCESS OF FILLING UP THE APPLICATION FORM FOR SUAT

- Candidate has to apply for SUAT-2025 only through "online" mode through the website **[www.silicon.ac.in/admissions-at-silicon/](http://www.silicon.ac.in/admissions-at-silicon/)**. Applicants are advised to read and follow the "*Instructions for Filling Application Form*" that is present in the online portal.
- The candidate not complying with the instructions mentioned shall be summarily disqualified.

- The candidate should provide all the authentic details (applicant’s details, academic details, course applied for, choice of exam center etc.) while filling up the online form. The applicant has to upload the required documents mentioned.
- Applicants should give options only with respect to Reservation Categories (SC/ST/PC) that he/she can substantiate the same with documentary evidences during document verification.

**Abbreviations for Different Reservation Category/Sub-category:**

SL. #	ABBREVIATIONS	DESCRIPTION
1.	SC	Scheduled Caste
2.	ST	Scheduled Caste
3.	PC	Physically Challenged
4.	WQ	Women Quota

- Reservation categories once given in the application form cannot be changed afterwards under any circumstances.
- Transfer of vacant seats from one category to General category is applicable only when there are vacant seats in that category.

**Note:**

**Importance and Requirement of Nativity/Residential Certificate**

Nativity certificate of Odisha is mandatory for taking admission against any of the reserved category seats along with other relevant certificates (SC, ST, and PC). To avail reservation under women quota, the nativity certificate is mandatory. Non-submission of nativity certificate automatically cancels Women Quota seat.

- All the information required must be duly filled so that the application will be considered complete. Incomplete/unsuccessful submission of application will lead to outright rejection.
- On submission of details, a *Registration Number* shall be generated.
- Candidates are allowed to submit only one application form. Multiple applications for a particular stream or in multiple streams by a candidate

are liable to be rejected. After submission of an application, options cannot be changed at a later stage.

- Facility of submission of application form will be closed on the last day of filling up online-application form submission. In order to avoid last minute rush, applicants are advised to complete the process well before the deadline.
- Any dispute arising out of SUAT-2025 shall only be settled and decided under the jurisdiction of Hon'ble High Court of Odisha.

#### **4. CONFIRMATION MESSAGE AND ADMIT CARD**

- Once the candidate submits the application, a message of confirmation will be sent through SMS/e-mail to the candidate. Hence, correct e-mail ID and contact numbers should be given.
- Candidates may check the status of their application on SUAT-2025 link present in the University website.
- All the Admit cards will be uploaded at *www.silicon.ac.in* at least one week before the date of examination.
- The Admit card will contain the Registration number, photograph, signature, SUAT-2025 date, time and examination center apart from other relevant information.
- The candidate has to download two copies of the Admit card which must be endorsed by the invigilator of the examination center on the day of the examination before allowing the candidate to appear the exam.
- If the candidate finds discrepancy in any information printed on the Admit card, he/she has to contact the University office immediately.
- Both the downloaded copies of the Admit cards should be signed by the invigilator during examination. One copy must be submitted at the examination hall and the other should be retained by the candidate.
- The candidate should keep the Admit card duly signed by invigilator till he/she takes final admission in the University.

#### **5. RULES FOR SUAT-2025**

- SUAT-2025 will be held as per the tentative schedule mentioned in the university website.
- The medium of examination is English.



- The examination hall shall be opened to the candidates **one hour before** the commencement of the examination. In no case the candidate is allowed to enter the examination hall after the commencement of the examination.
- No candidates will be allowed to enter the examination hall without a valid downloaded Admit card.
- Attendance will be taken by the invigilators on the attendance sheets in which the candidates shall have to put their full signature against their corresponding registration numbers/space provided. Also, the candidates have to give his/her left-hand thumb Impression against their corresponding registration numbers in the space provided.
- No candidate will be allowed to leave the hall before the time duration of the examination is over, except for emergency requirements.
- Books, printed papers (other than their Admit Cards), manuscripts or electronic gadgets such as mobile phones, cell phones and electronic diary, calculators etc, must not be taken into the examination hall. In case these prohibited materials are found, the candidate will be debarred from appearing for the examination and will have to leave the Hall.
- Candidates are not permitted to talk to each other in the examination hall. No one should receive any help from or assist others in any manner. Malpractice of any form detected during or after the examination would result not only in cancellation of the candidature but also is liable to more severe punishment as deemed fit by the SUAT Examination Committee.
- A candidate willing to say anything should raise up his/her hand until the invigilator attends to him/her. He/she should, on no account, leave the seat or make any noise to draw the invigilator's attention.
- The Centre Superintendent is empowered to take necessary decisions on any other matter, which may not be provided in these rules.
- Candidates having UGC-NET/CSIR NET/GATE/CAT or other similar national/state-level tests with qualifying percentile scores are exempted from the entrance test.

## **6. EXAMINATION PROCEDURE AND RANK LIST**

- Questions in SUAT-2025 will be of MCQ type.
- The examinee shall have to select the appropriate choice of answer in the assigned computer.

- The applicant has to attempt at least one question to get a “SUAT-2025 Rank” otherwise, his/her candidature will summarily be rejected and no Rank will be awarded to the applicant.
- There is no negative marking for wrong answers.
- On the basis of performance of applicants in SUAT-2025 entrance examination, separate merit lists of successful candidates shall be published for admission into various courses.
- The Rank card will be published in the Student’s LOGIN portal.
- The SUAT-2025 Results will be available on the university’s official website: [www.silicon.ac.in](http://www.silicon.ac.in)

## **7. ADMISSION PROCEDURE**

- All seats for M.Tech. and Ph.D. courses will be filled through OJEE Counseling and/or Silicon University Level Counselling.
- A candidate taking admission in any M.Tech. course should have a valid GATE score of current/previous academic session OR, is qualified in the PGAT entrance examination conducted by OJEE for that session OR, is qualified on the merit basis of SUAT examination for that academic year.
- Candidates having a score above the cut-off qualifying mark (fixed by the university at the time of declaration of SUAT-2025 result) will be called for an oral examination for admission to various Ph.D. programs. On qualifying the oral exam he/she will be offered a seat in this program.
- The qualified candidates shall be called for counseling at the University. The counseling and seat allocation for candidates qualified through SUAT-2025 will be purely on merit basis.
- It is mandatory for all qualified candidates through SUAT-2025 examination to participate in the counseling as per the schedule, failing which their seat will be allotted to another candidate.
- To finalize the admission process, the candidate must report to the university campus with original documents and semester fees by the reporting date mentioned in the Admission Offer Letter/Email.
- Counseling will be stopped as soon as all the seats reserved for the SUAT-2025 are filled up.
- In case, there remain any vacancies in any branches/programs of UG/PG courses, it is to be filled through SPOT round decided by the university.

The selection criterion for various programs is summarized below.

PROGRAM	BASIS OF SELECTION (PREFERENCE WISE)
M.Tech.	a) GATE-2023/GATE-2024 Rank b) OJEE-2024 (PGAT) Rank a) SUAT-2024 Rank
Ph.D.	SUAT-2025 Rank and Personal interview

## 8. SCHOLARSHIP OPPORTUNITIES

The scholarship opportunities for the academic year 2025 aims to support meritorious students across various courses. The scholarship provided by the university for M.Tech and Ph.D. courses are mentioned below.

### 8.1. M.Tech. courses

CRITERIA	CAREER	SCHOLARSHIP AMOUNT IN INR
GATE Qualified (For current and previous academic session)	More than 60% marks in 10 <sup>th</sup> and 12 <sup>th</sup> and Graduation	10,000 / month
PGAT Qualified	More than 60% marks in 10 <sup>th</sup> , 12 <sup>th</sup> and Graduation	25,000 / semester
SUAT Qualified		

The scholarship is applicable for the first semester program only. However, eligible students may continue to receive the scholarship in subsequent semesters if they meet the following criteria:

- Maintain a CGPA of 8.5 or above without any backlog papers.
- Maintain attendance of 80% and above in previous semesters.
- Have no pending disciplinary cases.
- The scholarship offer is not applicable for Tuition Fee Waiver (TFW) candidates.

## 9. FEE STRUCTURE

PROGRAM	BRANCHES	PROGRAM DURATION	FEE IN INR (PER SEMESTER)
M.Tech.	All	2 Years	75,000
Ph.D.	All	Min. 3 Years	15,000

- One time admission fees of Rs. 10,000/- for all M.Tech. programs at the time of admission.
- One time admission fees and registration fees of Rs. 10,000/- and Rs. 20,000/- respectively (i.e. Rs. 30,000/-) for all Ph.D. programs at the time of admission.
- Rs 1,000/- as counselling fees if the candidate takes admission through the university level counselling
- There would be 5% rebate on the fees if paid annually at beginning of the academic session.

## 10. QUESTION PATTERN AND DURATION FOR SUAT

Sl. #	PROGRAM	SUBJECTS, DURATION, NUMBER OF QUESTIONS
1.	M.Tech.	Number of questions : 90, Duration : 2 hours Branch Subject – 60 Engineering Mathematics – 20 Analytical & Logical Reasoning – 10
2.	Ph.D.	Total Marks : 70, Duration : 2 hours Research Methodology & English (compulsory) – 35 Respective Individual Disciplines – 35

## 11. ACTIVITY CALENDAR

SL. #	ACTIVITIES	M.Tech.	Ph.D. (JAN 2025)	Ph.D. (JUN 2025)
1.	SUAT-2025 Online Application Available from	20 <sup>th</sup> April 2025	14 <sup>th</sup> Nov 2024	10 <sup>th</sup> May 2025

SL. #	ACTIVITIES	M.Tech.	Ph.D. (JAN 2025)	Ph.D. (JUN 2025)
2.	Last date of Submission of Application	2 <sup>nd</sup> week of June 2025	8 <sup>th</sup> Dec 2024	16 <sup>th</sup> June 2025
3.	Declaration of Shortlisted Candidates	—	12 <sup>th</sup> Dec 2024	16 <sup>th</sup> June 2025
4.	SUAT-2025 Entrance Examination	3 <sup>rd</sup> week of June 2025	21 <sup>st</sup> Dec 2024	16 <sup>th</sup> June 2025
5.	Declaration of SUAT-2025 Results	4 <sup>th</sup> week of June 2025	24 <sup>th</sup> Dec 2024	16 <sup>th</sup> June 2025
6.	Personal Interview	—	Will be intimated to qualified candidates	Will be intimated to qualified candidates
7.	E-Counseling	1 <sup>st</sup> week of July 2025	—	—
8.	Reporting for Enrolment	1 <sup>st</sup> week of August 2025	3 <sup>rd</sup> week of Jan 2025	2 <sup>nd</sup> week of Jul 2025

\* There may be a change to the above mentioned dates subject to any changes to the Silicon University/OJEE 2025 e-Counseling dates.

## 12. SYLLABUS FOR SUAT-2025

### 12.1. M.Tech. Syllabus

A. Analytical and Logical Reasoning	–	10 Questions
B. Engineering Mathematics	–	20 Questions
C. Branch Subject	–	60 Questions

#### 12.1.1. ENGINEERING MATHEMATICS

**Ordinary Differential Equations:** Solution of first order, second order and higher order differential equations (separable equation, exact differential equation, homogeneous equation with constant co efficient, Euler Cauchy equations ,solution by undetermined coefficients and variation of parameters).

**Linear Algebra:** Matrices, Vectors, Determinants and linear system of equations, Eigen value problems, symmetric, skew symmetric, orthogonal matrices. Complex matrices, Hermitian matrices, Skew Hermitian and Unitary matrices, Similarity of matrices.

**Fourier series:** Fourier series and expansion of functions of any period, odd and even functions, half range expansion.

**Laplace Transform:** Use of Laplace transform for solving differential equations, Convolution and Integral equations.

**Complex Analysis:** Analytic functions, Cauchy-Riemann equations, Laurent's series, singularities and zeros.

**Numerical Methods:** Interpolation, numerical integration, solution of first order ordinary differential equations.

**Probability and Statistics:** Probability distribution (discrete and continuous), sampling distribution, correlation and regression analysis.

### 12.1.2. RESPECTIVE BRANCH SUBJECTS

#### i) COMPUTER SCIENCE / INFORMATION TECHNOLOGY

**Digital Logic:** Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point).

**Computer Organization and Architecture:** Machine instructions and addressing modes, ALU and data-path, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining, Cache and main memory, Secondary storage.

**Programming and Data Structures:** Programming in C; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps.

**Algorithm Analysis and Design:** Asymptotic notation, Notions of space and time complexity, Worst and average case analysis; Design: Greedy approach, Dynamic programming, Divide-and-conquer; Tree and graph traversals, paths; Hashing, Sorting, Searching. Connected components, Spanning trees, asymptotic analysis (best, worst, average cases) of time and space, upper and lower bounds, Basic concepts of complexity classes–P, NP, NP-hard, NP-complete.

**Theory of Computation:** Regular languages and finite automata, Context free languages and Push-down automata, Recursively enumerable sets and Turing machines.

**Compiler Design:** Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Code generation, Code optimization.

**Operating System:** Processes, Threads, Inter-process communication, Concurrency, synchronization, Deadlock, CPU scheduling, Memory management and virtual memory, File systems, I/O systems, Protection and security. **Internet and Web Technology:** Internet and web, IPv4 vs. IPV6, Web client & server, HTML.

**Computer Networks:** OSI layer, protocols in various layers, Different media in physical layer, TCP/IP, SMTP/Pop3, FTP.

## ii) ELECTRICAL ENGINEERING

**Electric Circuits and Fields:** Network graph, KCL, KVL, node and mesh analysis, transient response of dc and ac networks; sinusoidal steady-state analysis, resonance, basic filter concepts; ideal current and voltage sources, Thevenin's theorem, Norton's and Superposition and Maximum Power Transfer theorems, two- port networks, three phase circuits; Gauss Theorem, electric field and potential due to point, line, plane and spherical charge distributions; Ampere's and Biot-Savart's laws; inductance; dielectrics; capacitance. Mutual Inductance; Tuned coupled Circuit.

**Signals and Systems:** Representation of continuous and discrete-time signals; shifting and scaling operations; linear, time-invariant and Causal systems; Fourier series representation of continuous periodic signals; sampling theorem; Fourier, Laplace and Z transforms; Wavelet analysis.

**Electrical Machines:** Single phase transformer-equivalent circuit, phasor diagram, tests, regulation and efficiency; three phase transformers-connections, parallel operation; auto- transformer; energy conversion principles; DC machines-types, windings, generator characteristics, Excitation, armature reaction and commutation, starting and speed control of motors; three phase induction motors-principles, types, performance characteristics, starting, speed control and applications; salient/two reaction theory analysis; single phase induction motors; synchronous machines – performance, regulation and parallel operation of generators, motor starting, characteristics and applications; servo and stepper motors.

**Power Systems:** Basic power generation concepts; transmission line models and performance; Mechanical Design; cable performance, insulation; corona and radio interference; distribution systems; per-unit quantities; bus impedance and admittance matrices; load flow; voltage control; power factor correction; economic operation; symmetrical components; fault analysis; principles of over-current, differential and distance protection; solid state relays and digital protection; circuit breakers; system stability concepts, swing curves and equal area criterion; HVDC transmission and FACTS concepts for power quality, Reactive power compensation, Automatic generation control; Renewable Energy Power generation (PV/wind).

**Control Systems:** Principles of feedback; transfer function; block diagrams; steady-state errors; Routh and Nyquist techniques; Bode plots; root loci; lag, lead and lead-lag compensation; state Pole-zero addition, Stability of transfer function(system);space model; state transition matrix, controllability and

observability.

**Electrical and Electronic Measurements:** Bridges and potentiometers; PMMC, moving iron, dynamometer and induction type instruments; Potentiometer, Galvano meters, Damping scheme measurement of voltage, current, power, energy and power factor; instrument transformers; digital voltmeters and multi meters; phase, time and frequency measurement; Q-meters; oscilloscopes; potentiometric recorders; error analysis.

**Analog and Digital Electronics:** Characteristics of diodes, BJT, FET; amplifiers–biasing, equivalent circuit and frequency response; oscillators and feedback amplifiers; operational amplifiers–characteristics and applications; simple active filters; VCOs and timers; combinational and sequential logic circuits; multiplexer and De-multiplexer; Schmitt trigger; multi-vibrators; sample and hold circuits; A/D and D/A converters, 8051 microcontrollers. Introduction to 8085/8086 microprocessor basics & architecture, programming and interfacing of I/O devices.

**Power Electronics and Drives:** Semiconductor power diodes, transistors, GTOs, MOSFETs and IGBTs – static characteristics and principles of operation; triggering circuits; phase control rectifiers; bridge converters – fully controlled and half controlled; principles of choppers and inverters; basic concepts of adjustable speed DC and AC drives and variable frequency drive. Dual Converters.

### iii) ELECTRONICS ENGINEERING

**Network:** Mesh and nodal Analysis, Network theorems: superposition, Thevenin and Norton's maximum power transfer, Wye-Delta transformation. Steady state sinusoidal analysis using phasors. Linear constant coefficient differential equations; time domain analysis of simple RLC circuits, Solution of network equations using Laplace transform: frequency domain analysis of RLC circuits. 2-port network parameters: driving point and transfer functions. State equations for networks. Series and parallel resonance.

**Analog Electronics:** Energy band in silicon, intrinsic and extrinsic silicon. Carrier transport in silicon: diffusion current, drift current, mobility, and resistivity. Generation and Recombination of carriers. P-N junction diode, Zener diode, tunnel diode. 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. Precision rectifier. V-to-I and I-to- V converter. Op-amp-based active filters. Oscillators and signal generators.

**Digital Electronics:** Boolean algebra, minimization of Boolean functions; logic gates; digital IC families (DTL, TTL, ECL, MOS, CMOS). Combinatorial circuits: arithmetic circuits, code converters, multiplexers, decoders, Sequential circuits: latches and flip-flops, counters and shift-registers. Sample and hold circuits,



ADCs, DACs. Semiconductor memories. Microprocessor (8086): architecture, programming, memory and I/O interfacing.

**Signals, Systems and Communications:** Periodic and aperiodic signals. continuous-time and discrete-time Fourier series, continuous-time and discrete-time Fourier Transform, DFT and FFT, z-transform, transfer function, Impulse and frequency response of first-and-second order systems. Convolution, correlation and characteristics of linear time invariant systems. 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.

**Control Systems:** Open loop and closed loop (feedback) systems and stability analysis of these systems. Signal flow graphs and their use in determining transfer functions of systems; transient and steady state analysis of LTI control systems and frequency response. Tools and techniques for LTI control system analysis: root loci, Routh-Hurwitz criterion, Bode and Nyquist plots. Control system compensators: elements of lead and lag compensation, elements of Proportional-Integral-Derivative (PID) control. State variable representation and solution of state equation of LTI control systems.

**Electromagnetic Theory:** Elements of vector calculus: divergence and curl; Gauss' and Stokes' theorems, Maxwell's equations: differential and integral forms, Wave equation. Plane waves: propagation through various media; reflection and refraction; phase and group velocity; skin depth.

**Instrumentation and Measurement:** Static and dynamic characteristics of Instrument, Basic electrical measurement such as Resistance, Inductance and capacitance, oscilloscope and Multi-meter.

## 12.2. Ph.D. Syllabus

A.	Research Methodology & English	-	35 Marks
B.	Branch Subject	-	35 Marks

### 12.2.1. RESEARCH METHODOLOGY AND LANGUAGE

**Introduction to Research:** Research and its significance, process of research; types of research - experimental, theoretical, simulation, exploratory. The Scientific Method as the basis for enquiry and research. Research Questions, Hypothesis.

**Basic Statistics and Data Representation:** Basics of statistics - mean, median,

mode, standard deviation, correlation and regression, Normal distribution. Representation and interpretation of data, pie-charts, bar graphs, histograms.

**Journal/Conference Publications:** Structure and components of reports, thesis, journal articles and conference papers - (ILMRAD), title, abstract, keywords. References and bibliography. Citation & Indexing of Journals, Scopus and SCI. **IPR (Intellectual Property Rights):** IPR - patents, copyrights, registered designs, geographical indications & trademarks.

**English Language usage in Academic Writing:** Correct usage of English with elements of grammar and vocabulary. Sentence structure, use of prepositions, common errors. Elements of academic and formal writing.

## 12.2.2. ENGINEERING

### I) COMPUTER SCIENCE AND ENGINEERING

**Data Structure & Algorithms:** Introduction Data Structure, Performance of algorithms; *Data structures:* arrays, stacks, queues, trees, graphs, heaps, linear and binary search. Bubble sort, insertion sort, selection sort, merge sort, quick sort, heap sort.

**Computer Organization and Architecture:** *Digital Logic:* Boolean Algebra; Combinational and Sequential Circuits; Number Representations, Memory Hierarchy; Cache Memory.

**Computer Networks:** Concept of layering, Data and Signal, LAN technologies (Ethernet), flow and error control techniques, application layer protocols (DNS, SMTP, POP, FTP, HTTP), packet switching and circuit switching.

**Database Management Systems:** Introduction to DBMS, Relational model, Different normalforms, Transaction processing.

**Operating Systems:** Processes, CPU Scheduling, Deadlock.

**Programming in C:** Built-in data types, Operators and expression, Basic Input/Output statement, Branching & Looping statement, Array, Pointer, Function and parameter passing, Structure & Union.

**Engineering Mathematics:** Logic, Sets, Relations, Functions, Probability-Mean, median, mode, standard deviation, Poisson and binomial distribution, uniform, normal, exponential distributions.

### II) ELECTRONICS & COMMUNICATION ENGINEERING

**Fundamentals of Electronics and Analog Circuits:** *Diode Circuits:* Simple diode circuits, clipping, clamping and rectifiers. *BJT and MOSFET Amplifiers:* Biasing, small signal analysis, frequency response. Current mirrors and differential amplifiers, feedback and oscillator circuits. *Op-amp Circuits:*

Amplifiers, summers, differentiators, integrators.

**Digital Electronics and Microprocessors:** *Number Systems:* Binary, Decimal, Octal, Hexadecimal number systems and their conversions. *Combinational Circuits:* Boolean algebra, minimization of functions using Boolean identities and K-map, arithmetic circuits, code converters, multiplexers, decoders. *Sequential Circuits:* latches and flip-flops, counters, shift-registers, finite state machines. *Microprocessor (8085):* Architecture, programming, memory and I/O interfacing.

**Digital Signal Processing:** *Continuous-Time Signals:* Fourier series and Fourier transform, sampling theorem and applications. *Discrete-Time Signals:* DTFT, DFT, Z-transform. *LTI systems:* Definition and properties, causality, stability, impulse response, convolution, poles and zeroes, frequency response.

**Analog and Digital Communication:** *Analog Communications:* Amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, super heterodyne receivers, Noise in AM and FM. *Digital Communications:* PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, matched filter receiver, SNR & BER.

### **III) ELECTRICAL ENGINEERING (EE) and ELECTRICAL & ELECTRONICS ENGINEERING (EEE)**

**Fundamentals of Circuits and signals:** Basics of electrical and electronics, Circuit Analysis, magnetically coupled circuits, resonance, Time and frequency domain analysis of RLC circuits, 2-port network parameters, Continuous-time and discrete-time signals and systems, LTI systems and representations, Transform domain analysis (Fourier, Laplace, and Z-transforms), Discrete Fourier transforms (DFT).

**Power Electronics and Machine Drives:** Power electronics basics, AC to DC converters, DC to DC converters, DC to DC inverters, operation and speed control of electric machines (DC, induction, synchronous and special machines), pulse width modulation technique (SPWM).

**Control Systems:** Mathematical Modeling, Analysis in time and frequency domain, Controllers and compensator design, State space model, Controllability/observability.

**Power Systems:** AC and DC transmission and distribution, Models and performance of transmission lines and cables, Series and shunt compensation, Power Systems Analysis (Load-flow, admittance matrices, per-unit representation), Economic operation of power systems and unit commitment, Dynamics of synchronous machines, power systems stability, fault analysis, power systems protection, Voltage and Frequency control.

#### IV) ELECTRONICS AND INSTRUMENTATION ENGINEERING

**Fundamentals of Electronics and Analog Circuits:** *Diode Circuits:* Simple diode circuits, clipping, clamping and rectifiers. *BJT and MOSFET Amplifiers:* Biasing, small signal analysis, frequency response. Current mirrors and differential amplifiers, feedback and oscillator circuits. *Op-amp circuits:* Amplifiers, summers, differentiators, integrators.

**Digital Electronics and Microprocessors:** *Number Systems:* Binary, Decimal, Octal, Hexadecimal number systems and their conversions. *Combinational Circuits:* Boolean algebra, minimization of functions using Boolean identities and K-map, arithmetic circuits, code converters, multiplexers, decoders. *Sequential Circuits:* latches and flip-flops, counters, shift-registers, finite state machines. *Microprocessor (8085):* Architecture, programming, memory and I/O interfacing.

**Instrumentation and Control:** *Sensors & Transducers:* Sensors, Transducers and its classification, Resistive, capacitive, inductive type sensors and associated signal conditioning circuits. Strain gauges, RTD, Thermistor, LVDT, Capacitive Transducers, Bourdon tube, bellows, diaphragm. *Control System:* Concept of control system, Definition, Open Loop/Closed-loop, Feedback principles, signal flow graphs, transient response, steady-state-errors, phase and gain margins, on-off, P, P-I, P-I-D, cascade, optical sources and detectors.

**Digital Signal Processing and Communication:** *Signal Processing:* Discrete time signals/systems, Discrete time signal processing of continuous time signals. DTFT, DFT and Z-Transform. Design of FIR & IIR filters. *Communication Systems:* An Overview of Electronic Communication Systems, Amplitude Modulation Systems, Need for modulation, DSB-SC, SSB-SC, Analog Pulse Modulation, Sampling Theorem, Quantization of signals, Quantization error, Pulse Amplitude Modulation, Pulse Width Modulation and Pulse Position Modulation. Calculation of Signal to Noise Ratio - SSB-SC, DSB-SC.

#### 12.2.3. SCIENCE, MANAGEMENT, HUMANITIES AND SOCIAL SCIENCE

##### I) CHEMISTRY

**Language of Chemistry:** Gram atomic weight, Gram Molecular weight, Equivalent weight, Oxidation Number, oxidizing and reducing agents, Mole concept, methods of expressing concentrations of solutions (Normality, Molarity, Molality, etc).

**Solid State Chemistry:** Crystal packing, Miller Indices, Bragg's equation. Crystal

Structures and defects, Impact of defects on properties of materials, Electronic structure of solids.

**Electrochemistry and corrosion:** Types of Electrodes, Nernst Equation, Concentration Cells, Batteries, fuel cells, PV cells, Electrochemical Corrosion and its prevention.

**Colloidal chemistry:** Lyophobic and lyophilic sols, Electro-dialysis, Electro-phoresis, Electro-osmosis, Zetapotential, Coagulation, Surfactants, Emulsifiers, Flocculation values.

**Instrumental Techniques:** UV-Vis, IR, DTA, TGA , DSC and XRD.

**Polymers:** Tacticity, Types of Polymerization and Determination of Mol. Wt. of polymers, Basic ideas on some polymers like PVA, PVDF, Teflon, PMMA, PET, Nylon, Bakelite, and conducting polymers , Crystalline polymers, Glass Transition Temp.

## II) MATHEMATICS

**Fundamentals of Real & Complex Analysis:** Metric Space, limit points, Countable and uncountable sets, Sequences, Convergence and limit of a sequence, Functions, limit and continuity of a function, differentiability, behaviour of a function. Complex Numbers, Functions of a complex Variables, Analytic functions, Conformal Mapping, Line Integration, Cauchy's theorem and other theorems and formulas on line integration, Taylors Series, Laurent's Series, Singularities.

**Ordinary Differential Equations:** Exact differential equations and integrating factors, separable equations and equations reducible to this form, linear equations and Bernoulli's equation, special integrating factors and transformations. General solution of linear homogeneous and non-homogeneous equations of second order with constant coefficients and Euler's equation.

**Algebra:** Algebraic system: Semi group, Monoid and Group, Subgroups, order of a group, order of an element, finite groups, Cosets and Lagrange's theorem, Homomorphism, isomorphism, Normal subgroup, Cyclic group .Vector spaces, subspaces, linear independence, basis and dimension, Linear transformations, Matrices, Determinants, Inverse of a matrix, Eigen values and Eigen vectors of a matrix.

**Numerical Analysis:** Errors in Computation, Solution of transcendental and polynomial equation by different numerical methods and their rate of convergence. System of linear algebraic equations: Gaussian Elimination and Gauss Jordan methods, Jacobi and Gauss Seidel iteration method. Interpolation, numerical differentiation and Integration and solution of Ordinary differential equation.

**Probability Theory:** Axioms of Probability, Conditional probability, Bayes's

theorem, Random variables, probability distributions, discrete and continuous random variables, probability functions. Expected value of random variable, moments, Binomial distribution, Geometric distribution, Poisson distribution, Normal distribution.

**Multivariable Calculus & Vector Calculus:** Functions of several variables, limit and continuity of functions of two variables. Partial differentiation, Chain rule, directional derivatives, the gradient. Divergence and curl, Double integration.

### III) PHYSICS

**Classical Mechanics:** Orthogonal transformation, transformation matrix; Legendre transformation, Hamilton equation of motion; the equations of canonical transformation, Poisson's bracket and other canonical invariants; conditions for small oscillations.

**Quantum Mechanics:** Dirac's ket vectors, bra vectors, operators and their properties, operators representing observables; expectation values of operators, Hermitian operators, eigen values and eigen functions; time evolution of quantum states and operator; ( $L^2$ ,  $L_z$ ), Application of Schrodinger's wave equation: Particle in a box, finite potential well, potential barrier.

**Solid State Physics:** Lattice dynamics (mono and diatomic lattice), Einstein and Debye model for specific heat of insulators; free electron model- Sommerfeld model of free electrons, specific heat of metals, Hall effect; quantum theory of dia, para, ferro and anti-ferromagnetism; superconductivity.

**Nuclear and Particle Physics:** Binding Energy; radioactivity decay, half-life, nuclear reactions (Fission, Fusion), nuclear reactors in India, types of interactions (strong, weak, gravitational, electromagnetic), classifications of elementary particles and its properties.

### IV) MANAGEMENT

**Management:** Definition and scope, Management functions and process, Management Roles and Skills, Managing -systems and contingency perspective, Historical background of management, Managing Internal (Organizational Culture) and External Environment, Social responsibility and Managerial Ethics, Managerial Decision making- Process, Types of problems and decisions, Decision making conditions & styles.

**Functions of Management:** Planning and its features and process, types of plan, effective planning, Organizing and its process, formal and informal organization, directing and its elements and importance, staffing and functions, controlling & its features and process, tools of controlling.

**Marketing Management:** Nature and Scope, Marketing mix; Understanding the customer and competition, Segmentation, Targeting and Positioning; Product Life

Cycle; Brands-Meaning and Role; Brand building strategies;. Pricing objectives; Pricing concepts; Pricing methods. New Product Development; Promotion mix-Role and Relevance of advertising, Advertising-Planning, execution and evaluation. Distribution channel hierarchy; Role of each member in the channel.

**Human Resource Management:** Significance; Objectives; Functions; A diagnostic model; Organizing HRM function. Recruitment and Selection-Sources of recruits; recruiting methods; Selection procedure; Placement and Follow-up: Performance Appraisal System-Importance and Objectives; Techniques of appraisal system; Development of Personnel-Objectives; Determining Needs; Methods of Training & Development programs; Compensation and Benefits-Job evaluation techniques; Wage and salary administration; Fringe Benefits.

**Fundamentals of Accounting and Financial Management:** Preparation of Financial Statements, Income Statement and Balance Sheet, Financial Statement Analysis, Ratio Analysis. Marginal Costing — Concept and Managerial Applications, Cost-Volume-Profit Analysis and Break-Even Analysis. Objective, scope and functions of financial management. Sources of Finance or Capital, Working, Capital management. Risk and return Analysis.

## **V) ENGLISH**

**General:** Beginning to Restoration Age, Enlightenment to Romanticism, 19<sup>th</sup>-20<sup>th</sup> Century Literature, Indian Writing in English, Literary Theory and Criticism, English Language: Basic Concepts, Theories and Pedagogy, Literature in 21<sup>st</sup> Century.

## **VI) PSYCHOLOGY**

**Introduction to Psychology:** Definition and Goals of Psychology, Key Perspectives in Psychology Behavioral, Cognitive, Humanistic, Psychodynamic, and Socio-cultural, Methods in Psychology.

**Biological Bases of Behavior:** Structure and functions of Neuron, Structure and functions of the Central Nervous System, and Autonomic Nervous System.

**Perceptual Process:** Perceptual Organization: Gestalt, Figure and Ground, Law of Organization Perceptual Constancy: Size, Shape, and Color; Illusions Perception of Form, Depth and Movement.

**Learning:** Classical conditioning: Procedure, Phenomena and related issues. Instrumental learning: Phenomena, Paradigms and theoretical issues. Reinforcement: Basic variables and schedules. Verbal learning: Methods and materials, organizational processes.

**Memory & Forgetting:** Memory Processes: Encoding, Storage, Retrieval. Stages of Memory: Sensory memory, Short-term Memory (STM) and Long-term Memory (LTM), Episodic & Semantic memory. Theory of Forgetting: Interference, decay.

**Motivation:** Basic Motivational Concepts: Instincts, needs, drives, incentives, motivational cycle, Need, Process and Reinforcement Theories of Motivation

**Emotion:** Theories of emotions: James-Lange, Canon-Bard, Schechter & Singer.

**Thinking & Problem solving:** Concept formation: Rules, Types, Strategies; Role of concepts in thinking, Problem solving type, Strategies, and Obstacles.

**Personality:** Determinants of personality: Biological and socio-cultural. Approaches to the study of personality: Psychoanalytic, social learning, trait and type, cognitive. Self-Concept: Origin and development Psychometric and Projective assessment of personality.

**Human abilities:** Intelligence: Biological, Social determinants. Theories of Guilford, Gardner and Sternberg; Genetic and Environmental influences on Intelligence; Measuring Intelligence and Interpretation of Test scores.

## **VII) ECONOMICS**

**Micro Economics:** Demand analysis: Cardinal and Ordinal Approaches; Theory of Production and Costs; Pricing and output under different forms of market structure; Factor Pricings; Elements of equilibrium and new welfare economics.

**Macro Economics:** Determination of output and employment: Classical and Keynesian theories, Consumption Function and hypotheses; Demand for Money: Classical, Keynesian and Post Keynesian; Supply of Money, Money multiplier; Phillips Curve analysis; Business cycles Models; Samuelson, Hicks and Kaldor; Monetary and fiscal policies.

**Statistical and Mathematical Methods:** Data and Sampling: Data, Types, sources, technique of data collection, Sampling verses census, sampling technique, Correlation and Regression Analysis, Probability and distribution, Theoretical distributions, Testing of Hypothesis.

**Development Economics:** Economic Growth, Economic Development and sustainable Development; Vicious circle of poverty; Measurement of development conventional, HDI and quality of life indices; Theories of Development. Classical, Marx and Schumpeter; Theories of Economic Growth; Harrod-Domar model; Solow's model, steady state growth; Approaches to development: Balanced growth, critical minimum effort, big push, unlimited supply of labour, unbalanced growth, low equilibrium trap.

**Public Finance & International Trade:** Role of the state in economic activity: Allocation, distribution, stabilization functions; Private, Public and Merit goods; The Public Budgets, Zero-base budgeting; Public Expenditure; Hypotheses; effects and evaluation; Taxation; Public Debt: Sources, effects, burden and its management. Theories of International Trade; Terms of Trade and Economic Growth; Disequilibrium in Balance of Payment; Foreign trade multiplier; Impact of Tariffs, Partial and general equilibrium analysis; Tariff and non-tariff Barriers.



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