

VJTI MUMBAI

वीरमाता जिजाबाई तंत्रज्ञान संस्था

Veermata Jijabai Technological Institute

(Autonomous Institute of Govt. of Maharashtra)

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INFORMATION BROCHURE AND APPLICATION FORM

For

Admission to Doctor of Philosophy (Ph. D.)

2021-22

The information described in this brochure is applicable to the Ph.D. Programs listed below:

Programme Code	Name of the Programme	Department
901	Civil Engineering	Civil Engineering
902	Mechanical Engineering	Mechanical Engineering
903	Electrical Engineering	Electrical Engineering
904	Production Engineering	Production Engineering
905	Textile Technology	Textile Manufactures
906	Electronics Engineering	Electrical Engineering
907	Computer Engineering	Computer Engineering & Information Technology
910	Chemistry	Technical & Applied Chemistry

1. Schedule of Admission (Important dates):

Sr.No.	Activity	Date	Day
1	Available of online application forms mode	18/06/2021	Friday
2	Last date for submission of completed application forms	12/07/2021	Monday
3	Display of shortlisted candidates on website	19/07/2021	Monday
4 [#]	Clarification/Objection on shortlisted candidates	21/07/2021	Wednesday
5	Display of corrected shortlisted candidates	26/07/2021	Monday
6	Online Test conduct by respective department.	30/07/2021 (10.00 am)	Friday
7 [#]	Interview conduct by respective department.	02/08/2021 & 03/08/2021 (10.00 am)	Monday & Tuesday
8	Display of Final Merit List on website	09/08/2021	Monday
9	Last day for confirmation of provisional admission by paying fees	13/08/2021	Friday

In case of any clarification or objection on shortlisted candidates, the candidates may communicate by sending an email to phd_admission@vjti.ac.in by 21nd July 2021 before 4.00 pm

Written Test/Interview shall be conducted by concerned department at VJTI or online mode, depending upon the pandemic circumstances & Lockdown notifications.

2. Application Processing Fee:

General Category:	Rs 500
Reserved Category: SC, ST, VJ/DT- NT(A), NT(B), NT(C), NT(D), OBC, SBC, EBC , EWS & Differently abled person	Rs 300

Application processing fee shall be paid online as per procedure given in Annexure –V

3. Submission of the application:

Candidates must first submit their application form with necessary application fees (along with all the relevant certificates/documents) online through <https://www.vjti.ac.in/> (applications without online submission of application as well as certificates/documents will not be considered). Candidate should make sure all relevant details are duly filled in the respective fields. Access to the link for online submission of application opens on June 18, 2021 (Friday). Last date for the online submission of application is July 12, 2021 (Friday) 5.00 pm

Google link to fill Ph.D application form

<https://forms.gle/AEBDc2AhTGE6w7BE6>

4. Eligibility for Admission

Educational Qualification:

Subject to the conditions stipulated in Directive No. Exam./Thesis/Univ./VCD/947 of 2018 of Mumbai University, the following persons are eligible to seek admission to the Ph.D. programme:

- i) A candidate seeking admission to the Ph.D. programme shall have a Master's degree or a professional degree declared equivalent to the Master's degree by the corresponding statutory regulatory body, with at least 55% marks in aggregate or its equivalent grade 'B' in the UGC 7-point scale (or an equivalent grade in a point scale wherever grading system is followed) or an equivalent degree from a foreign educational institution accredited by an Assessment and Accreditation Agency which is approved, recognized or authorized by an authority, established or incorporated under a law in its home country or any other statutory authority in that country for the purpose of assessing, accrediting or assuring quality and standards of educational institutions.

Relaxation of 5% of marks, from 55% to 50%, or an equivalent relaxation of grade, shall be allowed for those belonging to reserved categories/Differently-Abled and other categories of candidates as per policies of the Government of Maharashtra prescribed from time to time, or for those who had obtained their Master's degree prior to 19th September, 1991. The eligibility marks of 55% (or an equivalent grade in a point scale wherever grading system is followed) and the relaxation of 5% to the categories mentioned above are permissible based only on the qualifying marks without including the grace mark procedures.

OR

- ii) A candidate possessing PhD. Degree of University of Mumbai or any other recognized university, as per the guidelines of the UGC from time to time, in a given subject and wants to pursue Ph.D. in the same or other subject.

Note: Institute reserves the rights to admit candidates based on merit and performance during Interview & written test. Mere satisfaction of minimum qualification does not entitle for admission to Ph.D. programs.

5. Procedure for Admission to Ph.D programmes

a) Entrance Test

The syllabus of the entrance test shall consist of 50% based on research methodology/Aptitude Test and 50% shall be subject specific. The test will consist of objective paper of 2 hours duration consisting of 100 marks for 100 multiple choice questions (MCQ) in the relevant discipline. (For subject specific syllabus refer Annexure – VI)

b) Interview

Candidates securing minimum fifty (50) marks in entrance test or exempted from the written test will be eligible for appearing for interview

c) Relaxation of 5 % of marks, from 50% to 45%. Shall be allowed for those belonging to reserved categories/Differently-Abled and other categories of candidates as per policies of the Government of Maharashtra prescribed from time to time.

6. Exemption from the Written Test

The following candidates shall be exempted from Written Test:

- i. Candidates qualified having valid scores in UGC-NET/UGC-CSIR NET ISLET/GATE /INSPIRE / PET (By Maharashtra Public Universities) and any other JRF holder of the apex bodies like CSIR/ UGC/ ICAR/ ICMR/ DBT/ DST/ ICSSR;
- ii. Ph.D. degree holder of University of Mumbai or any other recognized University who desires to pursue Ph.D. at VJTI.

Types of Ph.D. candidates

1. Full Time Non Sponsored/ Sponsored Research Scholar

Candidate is required to be available in the institute full time for period of at least three years. There is possibility of Research / Teaching assistantship available to the candidate from institute funds or research projects. Candidates sponsored by their parent organizations cannot avail of Research / Teaching assistantship. Sponsored candidates have to produce sponsorship letter in given format along with application form.

2. Part Time Sponsored Research Scholar / VJTI internal candidates

Candidate is required to complete at least two semester of residential requirement at the institute. Sponsored candidates have to produce sponsorship letter in given format along with application form. Institute internal candidates have to apply as part time research scholars only. Internal candidates have to work under VJTI supervisor and/or external supervisor from IIT or other research organizations (optional with recommendation from DAC).

Course Duration:

1. Minimum Three years for Full Time Non Sponsored/ Sponsored Research Scholar
2. Minimum Four Years for Part Time Sponsored Research Scholar / VJTI internal candidates.

No Objection Certificate:

All sponsored candidates must submit 'No Objection Certificate' from the employer in a format given in Annexure III along with application.

Sponsorship letter

All sponsored candidates must submit 'Sponsorship letter' from the employer in a format given in Annexure II along with application.

7. Reservations

The reservations will be as per reservation policy of Maharashtra State.

8. Fees for PhD Program (First Year)

Fees in Rs. for confirmation of Admission at VJTI for Ph. D. students	
(Sponsored)	(Non Sponsored)
1,08,954/-	83,954/-

If any change in fees for A.Y.2021-22 same will be communicated before the start of selection process.

Notes:-

- a) For confirmation of seat allotted, all candidates have to pay appropriate amount of fee as applicable.
- b) All reserve category students seeking admission to Ph.D. Programs, shall have to pay full fees at the time of admission/ registration.
- c) Candidate whose result of qualifying post graduate degree is awaited:
 - Must have submitted the thesis on the day of interview.
 - These candidates must submit the certificate as per Annexure IV and produce the copy of dissertation at the time of interview.
 - The admission shall be provisional and will be confirmed only if the result of qualifying examination is submitted on or before 30th November 2021.
- e) No change in category of admission (Full Time to Part Time or vice versa) will be allowed at the time of examination or admission.
- f) Information related to Ph. D. admission 2021-22 will be displayed only on VJTI website <http://www.vjti.ac.in/> Applicants shall visit the Institute website for time to time.

Annexure –I

List of Documents to attached along with application form

Attested photocopies of following documents/certificates should be attached with the application form at the time of submission. If a candidate fails to submit applicable documents/certificates along with application form, he/she will not be shortlisted for Ph. D. admission 2021-22.

Sr. No.	Document Name
1	Graduation degree certificate
2	Final year marks list / grade sheet
3	Post graduate degree certificate
4	Post graduate Final year marks list / grade sheet
5	Work/ Research experience Certificates
6	<p>Nationality Certificate: In lieu of this “Certificate of Indian Nationality” following Certificates/Documents will also be acceptable-</p> <ol style="list-style-type: none"> 1. Indian Passport in the name of the Candidate, issued by appropriate authorities. 2. The School Leaving Certificate indicating the Nationality of the Candidate as ‘Indian’. 3. Birth Certificate of the Candidate indicating the Place of birth of the Candidate is within India.
7	<p>Caste certificate: Candidates belonging to categories SC, ST, VJ/DT-NT(A), NT(B), NT(C), NT(D), OBC, SBC will be required to submit a Caste Certificate</p>
8	<p>Caste Validity Certificate: Candidates belonging to SC, ST, VJ/DT-NT (A), NT (B), NT(C), NT(D), OBC, SBC category are required to submit Caste Validity Certificate.</p>
9	<p>Non-Creamy Layer Certificate</p> <p>A candidate belonging to ‘Creamy Layer’ amongst the categories SBC, V.J./D.T.-N.T.(A),N.T.(B), N.T.(C), N.T.(D) ,O.B.C. must note that the provision of reservation is NOT applicable to him/her. A candidate claiming benefit of reservation under the categories SBC, V.J./D.T.-N.T.(A), N.T.(B), N.T.(C), N.T.(D), O.B.C. will be required to produce “Non-Creamy Layer Certificate” in the name of the candidate as specified in the Government Resolution No. CBC/10/2008/CR-697/BCW-5, dated 27th February 2009 or its updated versions from time to time. The certificate must be valid up to 31 March 2022.</p>
10	<p>Differently abled Certificate (if applicable):</p> <p>The candidate claiming to be physically handicapped shall produce a certificate from the Director, All India Institute of Physically Handicapped, Mumbai or Dean/Civil Surgeon of the Government / CIVIL HOSPITALS normally located at the District Headquarters, regarding his or her physical disability, and ability to undergo all parts of syllabus for the normal course. Candidates suffering from Dyslexia, Dysgraphica & Dyscalculia are required to produce certificate issued by the ‘Learning Disability Clinic, Lokmanya Tilak Municipal General Hospital, Sion, Mumbai-22’.</p>
11	Proof of Exemption for Written test
12	Annexure II
13	Annexure III
14	Annexure IV
15	Receipt of application processing Fee
16	Copy of first page of research papers published in journal / conferences
17	Statement of purpose from the candidate (one page justifying the research area)
18	Any other Certificates

Annexure -II

Format for Sponsorship Letter for Full time/Part Time sponsored candidate
(To be submitted at the time of application/ Interview.)

(To be filled in by sponsoring organization on their letter head only)

Date:

SPONSORSHIP LETTER

Shri. /Smt. /Ms. is a full time employee of our organization since (Date) and working as (Designation in the organization) from lastyears.

If selected, I / we hereby sponsor him/her to join the Ph.D. degree programme in Department of VJTI as

(a) Full Time Sponsored candidate for the period of Three years at VJTI

OR

(b) Part Time Sponsored candidate for the first year of Ph. D. programme to complete mandatory course work. Thereafter he/she will be allowed to report to the research supervisor for at least two working days in a month.

I / We shall relieve him/her of all responsibilities in our organization for a minimum period mentioned above to enable him/her to pursue the Ph.D. programme.

(Note: Tick Mark whichever is applicable from above a or b)

Signature of Sponsoring Authority

Name:

Designation:

Organization:

Place:

Date:



Annexure -III

Format for NOC for Full time/Part Time sponsored candidate
(To be submitted along with application form.)

(To be filled in by sponsoring organization on their letter head only)

Date:

No Objection Certificate

Shri. /Smt. /Ms. is a full time employee of our organization since (Date) and working as (Designation in the organization) from lastyears.

If selected, I / we have no objection to him/her to join the Ph.D. degree programme in Department of V J T I, Matunga, Mumbai – 400019 and will issue sponsorship letter as per Annexure II at the time of interview as a

(a) Full Time Sponsored candidate for the period of Three years at VJTI Mumbai

OR

(b) Part Time Sponsored candidate for the first year of Ph. D. programme to complete mandatory course work. Thereafter he/she will be allowed to report to the research supervisor for at least two working days in a month.

(Note: Tick Mark whichever is applicable from above a or b)

Signature of Sponsoring Authority

Name:

Place:

Designation:

Date:

Organization:



Annexure –IV

Format of Certificate

For candidate who have appeared in the qualifying degree examination i.e. M.E./M.Tech/MSc/MCA or Equivalent Examination and whose dissertation is submitted.
(To be filled along with application form)

(To be filled in by respective organization on their letter head only)

Date:

Certificate

Shri. /Smt. /Ms. is a M.Tech/M.E/MSc/MCA student of(Name of Programme) in our Institute for Academic Year and submitted his/her M.Tech/M.E/MSc/MCA dissertation on (Date) for evaluation.

Signature of
Head of Department/Principal/Director/ Authority

Name:

Place:

Designation:

Date:

Organization:



Annexure –V

Steps to be followed for making online payment (Application Processing Fee) through STATE BANK COLLECT

- Log On to <https://www.onlinesbi.com>
 - Home Page STATE BANK COLLECT
 - Click on State Bank Collect
 - Click Checkbox to accept ‘Terms & conditions’
 - Then click on ‘Proceed’
 - Select State as ‘Maharashtra’
 - Select Type of Category as ‘Educational Institutions’
 - Click on ‘Go’
 - Select the Name of the institution as ‘Vermata Jijabai Technological Institute’
 - Select the appropriate ‘Payment category’ as indicated below:
 - Application Processing Fee
 - On next screen Enter the details (like Name, Birth date, ID No. Should be ‘0’; Select your branch, Year ‘First Year’ mentioned in Remark as “PhD Application Fees” etc.) asked for
 - Select options, wherever necessary carefully
 - Proceed as instructed and Click on ‘Submit’
 - On next screen verify details and click on ‘Confirm’
 - You will be taken to payment gateway
 - Select appropriate payment mode
 - Check the charges/commission applicable for selected ‘Mode of Payment’
- Follow instructions to Print Challan and pay at any SBI branch in Cash
- OR
- Pay ‘online’ using Internet Banking / Credit / Debit card
- Print receipt online.
 - Copy of receipt (and not challan) should be enclosed with Application Form.

Make sure that the payments are made a day or two prior to Last date of submission of application. Institute is not responsible if the site is down for technical reasons and the last minute payments are not possible.

Annexure-VI

Syllabus for Ph.D. Entrance Examination

CIVIL & STRUCTURAL ENGINEERING

Sr.No	Areas of research for Ph.D. in Civil Engineering	Syllabus for entrance Test
1.	Construction Management	Construction Management, Construction Engineering, Construction techniques, Construction Materials, Contract management, Geospatial technology, Building drawings, Transportation Engineering
2.	Environmental Engineering & Water Resource Engineering	Environmental engineering, Solid waste hazard mgmt, Industrial waste hazard mgmt, Env. Impact Assessment, Advance Hydraulic , Water resource management Irrigation Engg, Water resource management, Advanced Hydrology, Advance Hydraulic , Ground Water Hydrology, Open channel flow, Dam and Hydraulics Structure
3.	Structural Engineering	Structural dynamics, Finite element method, FRP Composites, Plastic analysis, Plate and shell design, Geotechnical engineering, Earthquake engineering, Concrete technology, Pre-stressed Concrete, Advanced structural analysis, Adv. foundation engineering and Low cost housing.

NOTE:

- 1) Separate entrance test will be conducted for Ph.D. programs in Civil Engg with specialization areas in Structural Engineering, Construction Management, Environmental Engineering and Water resource Engineering
- 2) Candidate must appear for the entrance test of his or her M.Tech specialization / other specialization, He or She will be admitted only in the Ph.D. program of that specialization in which the candidates will pass the entrance test and not in any other specializations.

COMPUTER ENGINEERING & INFORMATION TECHNOLOGY

Sr. No.	Syllabus for entrance Test	
1.	Engineering Mathematics	Mathematical Logic, Probability, Set Theory & Algebra, Combinatory, Graph Theory, Linear Algebra, Numerical Methods, Calculus, logical reasoning and aptitude
2.	Discrete Mathematics	Set and Propositions, Computability and formal languages, Permutation, Combinations and Discrete probability , Relational and Functions, Graphs and planar Graphs , Tree and Cut-Sets ,Discrete Numerical Function and Generating function , Recurrence relations and recursive Algorithms , Groups and Rings
3.	Digital Logic	Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point).

4.	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.
5.	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. Searching and sorting
6.	Algorithms	Analysis, 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, Connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching. 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
7.	Theory of Computation	Regular languages and finite automata, Context free languages and Push-down automata, Recursively enumerable sets and Turing machines, Undesirability
8.	Compiler Design	Lexical analysis, Parsing, Syntax directed translation, Runtime environments, code optimization, Intermediate and target code generation
9.	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.
10.	Databases And Mining	ER-model, Relational model (relational algebra, tuple calculus), Database design, normal forms, Query languages (SQL), File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control, multimedia databases, spatial databases, parallel databases, distributed databases. Data Mining-association, classification, clustering, Web Mining.
11.	Software Engineering	Software Requirement Specification , Structured Systems Analysis & Design: Requirement modeling, Design Concept, Architectural Design, Component Level Design, User Interface Design ,Object Oriented Analysis & Design: Use case modeling, Class modeling, Dynamic Modeling, Action Oriented Design, Data Oriented Design, Object Oriented Design, Real time Design Techniques, Web Engineering: Modeling Web Application, Web Application Design , Software Reengineering , SOA, Software Project Management: Structured project ,OO Project & Web Project
12.	Computer Networks	ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion control, Networking Fundamentals: Introduction to OSI Model and TCP/IP Protocol Suite, IP Addressing, Application Layer Protocols :HTTP,WWW,SMTP,FTP,DNS,SNMP,NFS,RPC,TFTP , Transport Layer : TCP, UDP . Network Layer: IP, ARP, RARP, ICMP, IGMP , Routing Protocols - RIP , OSPF , BGP , Real Time Traffic

		over the internet (RTP, RTCP) ,Network Design: Internet work Connectivity –MAU’S, Multiplexers, Repeaters, Bridges, Routers, Hubs, Gate, VLANs, Planning A Network , Network Design
13.	Information Security	Introduction Security, Threats, Vulnerabilities, Attacks on Integrity, Confidentiality, Anonymity, Authentication, Authorization, Non-repudiation, Database Security, Operating systems security, network security, Network and web attacks and defense mechanism, Cryptography.
14.	Web Search And Multimedia Retrieval Systems	Multimedia Retrieval systems , Content Based Image Retrieval (CBIR) ,Audio Indexing and Retrieval , Video Indexing and Retrieval , Current Trends in Video Search, Web Search Basics.
15.	Cloud Computing And Storage Management	Basics of Cloud Computing , Cloud architecture, Services and Applications , Cloud Infrastructure and Virtualization , Exploring cloud services , Cloud Storage, Cloud Administration , Cloud Security Management , Cloud Service Providers ,SAN, NAS
16.	Distributed Algorithms	Theoretical methods for distributed algorithms, Asynchronous distributed systems, Leader election Algorithms, Mutual Exclusion, Resource Allocation Async Network Algorithms, FIFO, Broadcast vs. Multicast, Leader Election - Ring vs. arbitrary network MST, Minimum Spanning Tree ,.Algorithms Logical time Snapshots, Candy and Lamports, Termination detection Self stabilization, Fault Tolerance in synchronous and Asynchronous systems
17.	Object Oriented Programming	C++ / Java
18.	Web Technologies	HTML, XML, JavaScript , Java Bean, Web Servers and Servlets, JSP , Server Database Access, Application and Security
19.	Network Programming	Server Side Programming, Streams: Input Stream, Output Stream and Filter Stream, Threads: Returning Information from Thread, Synchronization, Deadlock, Scheduling, Thread Pool. Looking up Internet Addresses: The Inet4 Address and Inet6 Address, Network interface Class, URL & URLs: The URL Class ,URL Decoder, Socket Programming Socket for Client, Socket for Server, Secure Socket , UDP Datagram and Socket, URL Connections, Protocol Handlers, Content URL Connections, Protocol Handlers, Content Handlers RMI and Java Mail API

ELECTRICAL ENGINEERING

Sr.No.	Syllabus for entrance Test for Electrical Engg. Is shown below:
1.	Linear Algebra, Transform Theory, Network theory Electronic devices and Circuits, Analog and Digital Signal Processing Analog & digital Communication systems Control Systems: Classical Control, Non-linear System Analysis and Design Power Systems : Analysis, Stability and Control Electromagnetics, High Voltage Engg.

ELECTRONICS ENGINEERING

Sr.No.	Syllabus for entrance Test for Electronics Engg. Is shown below:
1.	Network theory, Analog and Digital circuits and systems, Signals and Signal Processing Analog & Digital communications, Biomedical engineering, Microprocessor Systems and Computer Organization, linear abstract algebra, groups, rings, fields, vector spaces, Error correcting codes

MECHANICAL ENGINEERING

Sr.No.	Syllabus for entrance Test	
1.	ENGINEERING MATHEMATICS	Linear Algebra: Matrix algebra, systems of linear equations, eigenvalues and eigenvectors. Calculus: Functions of single variable, limit, continuity and differentiability, mean value theorems, indeterminate forms; evaluation of definite and improper integrals; double and triple integrals; partial derivatives, total derivative, Taylor series (in one and two variables), maxima and minima, Fourier series; gradient, divergence and curl, vector identities, directional derivatives, line, surface and volume integrals, applications of Gauss, Stokes and Green's theorems. Differential equations: First order equations (linear and nonlinear); higher order linear differential equations with constant coefficients; Euler-Cauchy equation; initial and boundary value problems; Laplace transforms; solutions of heat, wave and Laplace's equations. Complex variables: Analytic functions; Cauchy-Riemann equations; Cauchy's integral theorem and integral formula; Taylor and Laurent series. Probability and Statistics: Definitions of probability, sampling theorems, conditional probability; mean, median, mode and standard deviation; random variables, binomial, Poisson and normal distributions. Numerical Methods: Numerical solutions of linear and non-linear algebraic equations; integration by trapezoidal and Simpson's rules; single and multi-step methods for differential equations.

2.	APPLIED MECHANICS AND DESIGN	<p>Engineering Mechanics: Free-body diagrams and equilibrium; friction and its applications including rolling friction, belt-pulley, brakes, clutches, screw jack, wedge, vehicles, etc.; trusses and frames; virtual work; kinematics and dynamics of rigid bodies in plane motion; impulse and momentum (linear and angular) and energy formulations; Lagrange's equation.</p> <p>Mechanics of Materials: Stress and strain, elastic constants, Poisson's ratio; Mohr's circle for plane stress and plane strain; thin cylinders; shear force and bending moment diagrams; bending and shear stresses; concept of shear centre; deflection of beams; torsion of circular shafts; Euler's theory of columns; energy methods; thermal stresses; strain gauges and rosettes; testing of materials with universal testing machine; testing of hardness and impact strength.</p> <p>Theory of Machines: Displacement, velocity and acceleration analysis of plane mechanisms; dynamic analysis of linkages; cams; gears and gear trains; flywheels and governors; balancing of reciprocating and rotating masses; gyroscope.</p> <p>Vibrations: Free and forced vibration of single degree of freedom systems, effect of damping; vibration isolation; resonance; critical speeds of shafts.</p> <p>Machine Design: Design for static and dynamic loading; failure theories; fatigue strength and the S-N diagram; principles of the design of machine elements such as bolted, riveted and welded joints; shafts, gears, rolling and sliding contact bearings, brakes and clutches, springs</p>
3.	FLUID MECHANICS AND THERMAL SCIENCES	<p>Fluid Mechanics: Fluid properties; fluid statics, forces on submerged bodies, stability of floating bodies; control-volume analysis of mass, momentum and energy; fluid acceleration; differential equations of continuity and momentum; Bernoulli's equation; dimensional analysis; viscous flow of incompressible fluids, boundary layer, elementary turbulent flow, flow through pipes, head losses in pipes, bends and fittings; basics of compressible fluid flow.</p> <p>Heat-Transfer: Modes of heat transfer; one dimensional heat conduction, resistance concept and electrical analogy, heat transfer through fins; unsteady heat conduction, lumped parameter system, Heisler's charts; thermal boundary layer, dimensionless parameters in free and forced convective heat transfer, heat transfer correlations for flow over flat plates and through pipes, effect of turbulence; heat exchanger performance, LMTD and NTU methods; radiative heat transfer, Stefan-Boltzmann law, Wien's displacement law, black and grey surfaces, view factors, radiation network analysis</p> <p>Thermodynamics: Thermodynamic systems and processes; properties of pure substances, behavior of ideal and real gases; zeroth and first laws of thermodynamics, calculation of work and heat in various processes; second law of thermodynamics; thermodynamic property charts and tables, availability and irreversibility; thermodynamic relations.</p> <p>Applications: Power Engineering: Air and gas compressors; vapour and gas power cycles, concepts of regeneration and reheat. I.C. Engines: Air-standard Otto, Diesel and dual cycles. Refrigeration and air-conditioning: Vapour and gas refrigeration and heat pump cycles; properties of moist air, psychrometric chart, basic psychrometric processes. Turbomachinery: Impulse and reaction principles, velocity diagrams, Pelton-wheel, Francis and Kaplan turbines; steam and gas turbines.</p>

4.	Materials, Manufacturing and Industrial Engineering	<p>Engineering Materials: Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.</p> <p>Casting, Forming and Joining Processes: Different types of castings, design of patterns, moulds and cores; solidification and cooling; riser and gating design. Plastic deformation and yield criteria; fundamentals of hot and cold working processes; load estimation for bulk (forging, rolling, extrusion, drawing) and sheet (shearing, deep drawing, bending) metal forming processes; principles of powder metallurgy. Principles of welding, brazing, soldering and adhesive bonding.</p> <p>Machining and Machine Tool Operations: Mechanics of machining; basic machine tools; single and multi-point cutting tools, tool geometry and materials, tool life and wear; economics of machining; principles of non-traditional machining processes; principles of work holding, jigs and fixtures; abrasive machining processes; NC/CNC machines and CNC programming.</p> <p>Metrology and Inspection: Limits, fits and tolerances; linear and angular measurements; comparators; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly; concepts of coordinate-measuring machine (CMM).</p> <p>Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools; additive manufacturing.</p> <p>Production Planning and Control: Forecasting models, aggregate production planning, scheduling, materials requirement planning; lean manufacturing.</p> <p>Inventory Control: Deterministic models; safety stock inventory control systems.</p> <p>Operations Research: Linear programming, simplex method, transportation, assignment, network flow models, simple queuing models, PERT and CPM.</p>
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PRODUCTION ENGINEERING

Sr.No.	Syllabus for entrance Test	
1.	Metal Casting:	Casting processes – types and applications; patterns – types and materials; allowances; moulds and cores – materials, making, and testing; casting techniques of cast iron, steels and nonferrous metals and alloys; solidification; design of casting, gating and risering; casting inspection, defects and remedies.
2.	Metal Forming:	Stress-strain relations in elastic and plastic deformation; concept of flow stress, deformation mechanisms; hot and cold working – forging, rolling, extrusion, wire and tube drawing; sheet metal working processes such as blanking, piercing, bending, deep drawing, coining and embossing; analysis of rolling, forging, extrusion and wire /rod drawing; metal working defects.

3.	Metal Joining Processes:	Welding processes – manual metal arc, MIG, TIG, plasma arc, submerged arc, electro-slag, thermit, resistance, forge, friction, and explosive welding; other joining processes – soldering, brazing, braze welding;
		inspection of welded joints, defects and remedies; introduction to advanced welding processes – ultrasonic, electron beam, laser beam; thermal cutting. Merchant's analysis; selection of machining parameters; tool materials, tool wear and tool life, economics of machining, thermal aspects of machining, cutting fluids, machinability; principles and applications of nontraditional machining processes – USM, AJM, WJM, EDM and Wire cut EDM, LBM, EBM, PAM, CHM, ECM.
4.	Tool Engineering:	Jigs and fixtures – principles, applications, and design; press tools – configuration, design of die and punch; principles of forging die design.
5.	Metrology and Inspection:	Limits, fits, and tolerances, interchangeability, selective assembly; linear and angular measurements by mechanical and optical methods, comparators; design of limit gauges; interferometry; measurement of straightness, flatness, roundness, squareness and symmetry; surface finish measurement; inspection of screw threads and gears; alignment testing of machine tools.
6.	Powder Metallurgy:	Production of metal powders, compaction and sintering.
7.	Polymers and Composites:	Introduction to polymers and composites; plastic processing – injection, compression and blow molding, extrusion, calendaring and thermoforming; molding of composites.
8.	Manufacturing Analysis:	Sources of errors in manufacturing; process capability; tolerance analysis in manufacturing and assembly; process planning; parameter selection and comparison of production alternatives; time and cost analysis; manufacturing technologies – strategies and selection.
9.	Computer Integrated Manufacturing :	Basic concepts of CAD, CAM, CAPP, cellular manufacturing, NC, CNC, DNC, Robotics, FMS, and CIM.
10.	Product Design and Development:	Principles of good product design, tolerance design; quality and cost considerations; product life cycle; standardization, simplification, diversification, value engineering and analysis, concurrent engineering.
11.	Engineering Economy and Costing:	Elementary cost accounting and methods of depreciation; break-even analysis, techniques for evaluation of capital investments, financial statements.
12.	Work System Design:	Taylor's scientific management, Gilbreth's contributions; productivity – concepts and measurements; method study, micro-motion study, principles of motion economy; work measurement – stop watch time study, work sampling, standard data, PMTS; ergonomics; job evaluation, merit rating, incentive schemes, and wage administration; business process reengineering.
13.	Facility Design:	Facility location factors and evaluation of alternate locations; types of plant layout and their evaluation; computer aided layout design techniques; assembly line balancing; materials handling systems.
14.	Production Planning and Inventory Control:	Forecasting techniques – causal and time series models, moving average, exponential smoothing, trend and seasonality; aggregate production planning; master production scheduling; MRP and MRP-II; order control and flow control; routing, scheduling and priority dispatching; push and pull production systems, concept of JIT manufacturing system; logistics,

		distribution, and supply chain management; Inventory – functions, costs, classifications, deterministic and probabilistic inventory models, quantity discount; perpetual and periodic inventory control systems.
15.	Operation Research:	Linear programming – problem formulation, simplex method, duality and sensitivity analysis; transportation and assignment models; network flow models, constrained optimization and Lagrange multipliers
16.	Machining and Machine Tool Operations:	Basic machine tools; machining processes-turning, drilling, boring, milling, shaping, planning, gear cutting, thread production, broaching, grinding, lapping, honing, super finishing; mechanics of machining – geometry of cutting tools, chip formation, cutting forces and power requirements, simple queuing models; dynamic programming; simulation – manufacturing applications; PERT and CPM, time-cost trade-off, resource leveling.
17.	Quality Management:	Quality – concept and costs, quality circles, quality assurance; statistical quality control, acceptance sampling, zero defects, six sigma; total quality management; ISO 9000; design of experiments – Taguchi method.
18.	Reliability and Maintenance:	Reliability, availability and maintainability; distribution of failure and repair times; determination of MTBF and MTTR, reliability models; system reliability determination; preventive maintenance and replacement, total productive maintenance – concept and applications.
19.	Intellectual Property System:	Definition of intellectual property, importance of IPR; TRIPS and its implications, patent, copyright, industrial design and trademark.
20.	Organizational Behavior & Industrial Management:	HRD, HRM, Organization, Management, Administration.
21.	Project Management:	Risk management, Disaster management, Technology Management, Innovation, Entrepreneurship & Business Transformation, MIS & Enterprise Resource Planning, Operations strategy, Supply Chain Management, Infrastructure Management.

TEXTILE TECHNOLOGY

Sr.No.	Syllabus for entrance Test	
1.	Fiber Science & High Performance Fiber:	Polymer, processes involved in conversion of polymer to fiber, structure development in fiber, properties of fiber, structure property correlation. Modern techniques in man-made fiber production. Raw materials, Production process & Application of high performance fibers
2.	Yarn & Fabric Formation:	Preparatory processes. Different methods of yarn/fabric formation. Technological advances in yarn/fabric manufacturing, structure and structure- property relationship. Knitting techniques, classification, application etc.
3.	Chemical Processing & Eco textile Production:	Preparatory processes e.g. singeing, desizing, scouring, bleaching, mercerizing, heat setting of textiles. Dyeing, printing and finishing of textiles. Development of eco-textile products coated & laminated materials; surface modification techniques for textile materials.
4.	Technical Textile & Nonwovens:	All areas of technical textiles, product development & processes, Textile composites, Nonwovens, classification of nonwovens, evaluation and applications.

5.	Testing:	Sampling procedures. Fundamentals of testing of textile materials in various forms, testing methods for evaluation of various properties of Textiles.
6.	Apparel Manufacturing & Merchandising:	Patterning, drafting and marker planning, sewing, quality control aspects, visual merchandising, retail and supply chain management.

CHEMISTRY

Sr.No.	Syllabus for entrance Test	
1.	Catalysis :	Surface and colloidal chemistry, Types of catalysis, Homogenous and heterogeneous catalysis, ion exchange catalyst, zeolites, criteria for selection of catalyst for industrial processes.
2.	Polymer Science :	Polymerization mechanism, polymer synthesis, characterization, polymer blends, amorphous and crystalline polymers, glass transition temperature, structure and property relationship of polymers, recycling of plastics.
3.	Nanochemistry :	Nano materials, structural features, characteristic property of nanomaterials, nano synthesis, characterization, applications
4.	Environmental Chemistry :	Types of pollution, preventive methods, industrial effluents, chemical analysis of effluents, COD, BOD, detection of toxic metals, ions, pesticides.
5.	Solution chemistry:	Chemistry of liquid, chemical equilibrium, phase equilibrium, thermodynamics of solution
6.	Analytical Chemistry:	Spectroscopic methods of analysis such as UV, IR, NMR, chromatographic techniques, thermal methods of analysis
7.	Co-ordination chemistry:	Crystal field theory, ligand field theory, properties of transition elements, chemical bonding
8.	Types of organic reactions	Reaction mechanisms, name reactions, organic reagents
9.	Green chemistry:	Principles of green chemistry, significances, applications
10.	Chemistry of materials :	Effect of structure on the properties of metals, polymers and inorganic materials