



DELHI TECHNOLOGICAL UNIVERSITY

(Formerly Delhi College of Engineering)

ISO 9001:2015 Certified

ACCREDITED with 'A' Grade (CGPA 3.22 out of 4.0) by NAAC



ADMISSION
BROCHURE

Ph.D.

SESSION:
JANUARY, 2023

PH.D. ADMISSIONS: SESSION: JANUARY, 2023

TENTATIVE ADMISSION SCHEDULE

AND IMPORTANT DATES

(For Final Schedule & Important Dates, visit DTU website: www.dtu.ac.in)

S. No.	Activity / Event	Date
1.	Advertisement in newspapers	03.11.2022 (Thursday)
2.	Opening of website for Online Registration	04.11.2022 (Friday)
3.	Last date for Online Registration and Registration Fee Deposit	22.11.2022 (Tuesday) 12:00 Midnight
4.	Display of list of shortlisted candidates for written test on DTU website	29.11.2022 (Tuesday) 8:00 PM
5.	Date of Screening Test	12.12.2022 and 13.12.2022 (Monday & Tuesday)
6.	Declaration of Result on DTU website	14.12.2022 (Wednesday)
7.	Dates for Interview	19.12.2022 & 20.12.2022 (Monday & Tuesday)
8.	Declaration of final result on DTU website	23.12.2022 (Friday)
9.	Dates for Document verification and Admission (Candidates are required to report along with original documents and Demand Draft for admission fee)	27.12.2022 & 28.12.2022 (Tuesday & Wednesday)
10.	Display of vacant seats for waitlisted candidates on DTU website	29.12.2022 (Thursday) 5:00 PM
11.	Last round of admissions, if required (Candidates are required to report along with original documents and Demand Draft for admission fee)	30.12.2022 (Friday) at 10:00 AM

DTU Website: www.dtu.ac.in

Note : Candidates are advised to read the brochure carefully and to visit the website www.dtu.ac.in regularly for updates and other details about the entire admission process.



DELHI TECHNOLOGICAL UNIVERSITY

(Formerly Delhi College of Engineering)

ADMISSION
BROCHURE



Ph.D.

SESSION:
JANUARY, 2023

DTU MAP



1. Open Air Theatre (OAT)
2. Electrical Deptt.
3. Electronics Deptt. (GF)
IT Deptt. (GF)
Computer Deptt. (FF)
Software Deptt. (SF)
4. Civil Deptt. (GF)
Environment Deptt. (GF)
5. Civil Lab
6. Main Canteen
7. Mechanical, Production &
Industrial and Automobile
Deptt. (GF)
Bio Technology (TF)

16
MAIN GATE
Entry / Exit

8. Mechanical Workshop
9. Science Block
Humanities (GF)
Applied Mathematics (FF)
Applied Chemistry (SF)
Applied Physics (TF)
10. Sports Complex
11. Department of Design
12. Library
13. Auditorium
14. Computer Centre and T&P
15. Delhi School of Management
16. Entry/Exit Main Gate
17. Raj Soan Hall



दिल्ली प्रौद्योगिकी विश्वविद्यालय DELHI TECHNOLOGICAL UNIVERSITY

Established by Govt. of Delhi vide Act 6 of 2009

(Formerly Delhi College of Engineering)



Prof. Jai Prakash Saini
Vice-Chancellor



Message

It is my immense pleasure to announce that Delhi Technological University is commencing Ph.D. admissions Session: January, 2023.

Delhi Technological University is globally known for outstanding education, research and innovations. The University currently offers various interdisciplinary and industry relevant programmes in science, technology, management and allied areas at undergraduate, post-graduate and doctoral levels.

Students admitted to DTU through their dedication, discipline and steadfastness can go on, to become professionals and impactful leaders. DTU provides them an environment to shape their talent as DTU ensures that every step of a student's journey is designed keeping in mind the holistic development. This is coupled with a diverse range of extra-curricular activities throughout the year, which help students develop various skills to facilitate them throughout their lives.

Over the years, DTU has established itself as the University of unshakable repute. Hence, getting admission in DTU has scaled great heights on the national and international stages, and continue to make us proud. The Conjoined efforts of relentless students, faculty, administration and the staff have preserved and exceptional environment in DTU that allows persistent exchange of information and upholds the unmatched excellence associated with this University for eight decades.

We aim at nurturing the students holistically and endeavour to foster a culture in which virtues and skills are instilled in them, along with a concern for society and its wellbeing.

I send my best wishes to the candidates applying for admissions to the Delhi Technological University.

(Prof. Jai Prakash Saini)

Shahbad Daulatpur, Bawana Road, Delhi – 110042, INDIA
Off. : +91-11-27882284 | Website : www.dtu.ac.in | E-mail : vcdu@dtu.ac.in

About **Delhi Technological University**





About **DELHI TECHNOLOGICAL UNIVERSITY**

Delhi Technological University (Formerly known as Delhi College of Engineering) is one of the most well-known engineering institutions of India, with over 80 years of glorious tradition behind it. A non-affiliating, teaching and research University, DTU is poised to create an environment of synergetic partnership between academia and industry. It aims to cause a major departure from the conventional system of education and research and aspires to imbibe a culture of scientific research in its technology disciplines and technology temper in its scientific research and education by providing a seamless environment for integration of science and engineering. The University also endeavours to provide the thrill of a corporate R&D environment with a planned focus on industrially relevant projects and technology incubation. DTU has consistently been ranked among the top engineering institutions of the country in reputed surveys.

Currently the University offers 17 Full time UG Programmes, 25 Full Time and Part Time M. Tech. Programmes, 05 Full time MBA programmes, 01 Executive MBA Weekend programme, 04 M.Sc. programmes, M.Des. M.A. Economics Programme and Ph.D. programme in various disciplines. Further, teachers from various engineering colleges also join University for the doctoral programmes under Quality Improvement Programme (QIP). The University on an average admits 3200 candidates for the Undergraduate Programmes and about 1200 candidates for different Postgraduate programmes and Doctoral programmes every year.

The University is located in about 163.87 acres of natural flora and fauna, DTU is one of the greenest residential campuses in the country. It has added the dimension of research and caused innovations in plenty, which has received high national and international acclaim. The University has the desired autonomy to excel and shape itself as a world class Technological University.

More information about DTU can be accessed at www.dtu.ac.in

VISION

To be a world class university through education, innovation and research for the service of humanity.

MISSION

To establish centres of excellence in emerging areas of science, engineering, technology, management and allied areas.

To foster an ecosystem for incubation, product development, transfer of technology and entrepreneurship.

To create environment of collaboration, experimentation, imagination and creativity.

To develop human potential with analytical abilities, ethics and integrity.

To provide environment friendly, reasonable and sustainable solutions for local & global needs.

1. RESEARCH FACILITIES AT DTU

All the academic departments of the university have well equipped research laboratories and workshop facilities. In addition, there are a number of central facilities such as Central Workshop, Solar Energy Centre, Central Instrumentation, Centres for Advanced Studies & Research in Automotive Engineering, TIFAC-CORE, Central Library and Computer Centre. The Central Library has more than 200,000 books, a large collection of back volumes of periodicals, standard specifications and other literature. It subscribes more than 39,924 current journals in Science, Engineering, Humanities and Social Sciences as e-resources. DTU has a well-equipped centralized Computer Centre which provides state of art high-end networked computing facilities to students and staff.

The University has many research collaborations with leading universities and Institutes in Korea, Singapore, France, Florida USA, Africa and China. As part of these collaborations, the students get opportunities to carry out joint research projects with faculty and students from these institutions.

The location of DTU in close proximity to several leading R&D Centres namely NPL, INMAS, FICCI, CSIR, etc. and other major industrial establishments which offers excellent opportunities to interact and plan research programmes and projects in collaboration.

To celebrate the individual's excellence in research, the university offers Research Excellence Awards to researchers in three categories of awards annually, namely, Outstanding Research Awards, Premier Research Awards, and Commendable Research Awards. The awards are open to all the researchers of DTU.

2. STUDENTS AMENITIES AT DTU

The University has 11 Boys and 3 Girls hostels in the campus that can

accommodate around 2700 students. Each hostel is an independent entity with its own mess facilities, recreation areas, etc. However, students are also permitted to have their own arrangements for accommodation outside campus.

Every hostel has its own common room and gymnasium. Additionally, every hostel subscribes to the latest magazines and newspapers for the residents. The hostels are connected to the campus via the campus wide wi-fi network and LAN which enables the residents to browse the internet and access the online library resources for their academic and research related work.

The Well-planned Students' Welfare societies routinely organize several vibrant extracurricular events. These activities include Sports, Cultural programmes, technical festival and Social Service.

3. Ph.D. PROGRAMME

The University is inspired by talent and driven by innovations and is firmly committed to provide industry-relevant, socially-responsible manpower to meet the challenges of 21st Century. The vibrant culture of research and innovations in DTU campus inspires students from UG level onwards to engage in cutting edge technology development and discover the value and worth of the knowledge acquired by them during their studies.

The University offers Ph.D. programme in a wide range of areas in Engineering, Sciences and Humanities. The academic programme leading to the Ph.D. degree is broad-based and involves a course credit requirement and a research publications leading to thesis submission. Facilities for research work leading to the Ph.D. degree are available in Departments of Mechanical Engineering, Information Technology, Environmental Engineering,

Electrical Engineering, Electronics & Communication Engineering, Humanities & USME, Design, Delhi school of Management, Computer Science & Engineering, Civil Engineering, Biotechnology, Applied Physics, Applied Mathematics, Applied Chemistry, Polymer Science & Technology & Software Engineering.

DTU also offer Ph.D. Admissions under the AICTE QIP (Quality Improvement Program) and AICTE Doctoral Fellowship (ADF) scheme.

4. ADMISSION CATEGORIES

The applicant for admission to the Ph.D. programme shall be classified under any one of the following categories which will be decided and recommended by DRC/SRC.

4.1 Full-time Research student/ Candidate

Full Time University Research student/candidate (With Fellowship or without Fellowship).

- i. Full-Time students with DTU Fellowship admitted within the DTU Fellowship seat matrix. Further, DTU Fellowship beyond 03 years and upto 04 years, subject to acceptance/publication of one research paper as per specifications given in the DTU Ph.D. Ordinance.

Furthermore, if a candidate who is admitted as Full Time research scholar with DTU Fellowship chooses to withdraw from the Ph.D. programme, due to ANY reason, the candidate shall be liable to refund the full amount of fellowship disbursed to him/her.

- ii. Full-Time students without Fellowship can be admitted over and above DTU Fellowship seat matrix. The number of such seats will be based on suitability of candidates and availability of slots with prospective supervisors.

- iii. Full Time Sponsored Research student /candidates - Fully financed by the Govt./Semi-Government Organizations like QIP, CSIR, UGC, NET, DAE, DST, DBT, NBHM, ICCR, ICAR, ICMR, GPAT, NDF, INSPIRE etc., Government / Private funded Research/Development Organisation, Public Sector Undertaking, Educational Institution or a reputed industry etc. **These seats with Fellowship from other agencies shall be over and above the seat matrix with University Fellowship.**

- iv. Full Time / Part Time Sponsored Research student/candidate nominated by the organization having MOU with the University, foreign students who apply through Ministry of Human Resource Development or under a Cultural Exchange Fellowship Programme by Government of India.

4.2 Part - Time Research student/ candidate

- i. Research student / Candidate working in other organizations having MOU with Delhi Technological University.
- ii. Faculty or Scientists from Educational Institutions, R&D organizations, and Government Department / Public Sector Undertaking / Candidates from industry of high repute and a medium sized enterprise with turnover Rs. 75 crores or above along with standing commitment to the exemplary standards namely ISO/CMM level 3 or similar standard of respective area provided that the applicant possesses the minimum eligibility qualifications for the degree.
- iii. Students with valid JRF may also be considered for admission in Part-Time Ph. D. Programme without fellowship.

4.3 Candidate / Staff under R & D project at DTU

Project staff under projects sponsored by DST/ UGC/ any government agency, industry or centres established from grant in aid from government or international agencies at University.

4.4 Research student/Candidate working as a regular employee

Permanent academic staff of the Delhi Technological University (Including the academic staff of erstwhile Delhi College of Engineering).

5. ADMISSION ELIGIBILITY

Academic Department	Disciplines Offered	Discipline Specific Eligibility Criteria
Applied Chemistry	1. Chemistry	Master's degree in Sciences in Chemistry / Applied Chemistry / Industrial Chemistry / Polymer Chemistry / Polymer Science / Electrochemistry / Pharmaceutical Chemistry / Material Chemistry / Material Science / Drug Chemistry / Medicinal Chemistry / Green Chemistry / Environment Chemistry / Environment Science / Chemical Science / Biochemistry / Nanomaterials / Nanoscience / Food Science / Metallurgy / Agrochemicals / and Chemistry related disciplines with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU
	2. Chemical Engineering	Master's degree in Engineering/Technology in Chemical Engineering/ Chemical Technology / Polymer Engineering / Polymer Technology / Textile Engineering / Textile Technology / Nanotechnology / Biotechnology / Biochemical Technology / Biochemical Engineering / Bioprocess Engineering / Environmental Engineering / Food Technology and Chemical Engineering related disciplines with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU. OR Bachelor's degree in Engineering/Technology in Chemical Engineering/ Chemical Technology / Polymer Engineering / Polymer Technology / Textile Engineering / Textile Technology / Nanotechnology/ Biotechnology/ Biochemical technology/ Biochemical Engineering / Bioprocess Engineering / Environmental Engineering / Food Technology and Chemical Engineering related disciplines with a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.
Applied Physics	1. Physics	Master's degree in Engineering / Technology / Sciences in relevant disciplines or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU OR Bachelor's degree in Engineering/Technology in relevant discipline or equivalent with a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.
	2. Engineering Physics	Master's degree in Engineering/Technology in relevant disciplines or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU OR Bachelor's degree in Engineering/Technology in relevant discipline or equivalent with a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.

Academic Department	Disciplines Offered	Discipline Specific Eligibility Criteria
Applied Mathematics	1. Mathematics	Master's degree in Sciences / Arts in relevant disciplines or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU
	2. Mathematics and Computing	Bachelor's degree in Engineering / Technology and Master's degree in Engineering / Technology in relevant disciplines or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU OR Bachelor's degree in Engineering / Technology in relevant discipline or equivalent with a minimum 75% in aggregate or equivalent CGPA as determined by DTU and having proven research capability NOTE: Entrance Exam will be 30% in Mathematics Domain and 70% in Computing Domain
Biotechnology	Biotechnology	Master's degree in Engineering / Technology / Sciences in relevant discipline or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU OR Bachelor's degree in Engineering / Technology relevant to Life Sciences with a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.
Civil Engineering	1. Civil Engineering	Master's degree in Engineering / Technology in relevant discipline or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU OR Bachelor's degree in Engineering / Technology in relevant discipline or equivalent with a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.
	2. Geoinformatics	
Computer Science & Engineering	Computer Science and Engineering	Bachelor's degree in Engineering / Technology and Master's degree in Engineering / Technology in Computer Science and Engineering / Software Engineering / Information Technology / Mathematics and Computing / Electronics and Communication Engineering or equivalent with a minimum 55% in aggregate or equivalent CGPA as determined by DTU OR Bachelor's degree in Sciences / Computer Applications and Master's degree in Computer Applications (with Mathematics at B.Sc./B.C.A level) with a minimum 75% in aggregate or equivalent CGPA as determined by DTU and having proven research capability OR Bachelor's degree in Engineering / Technology in Computer Science and Engineering / Software Engineering / Information Technology / Mathematics and Computing / Electronics and Communication Engineering. or equivalent with a minimum 75% in aggregate or equivalent CGPA as determined by DTU and having proven research capability
Delhi School of Management	Management	Master's degree in Engineering / Technology / Sciences / Management / Humanities and Social Sciences in relevant discipline or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU.
Electrical Engineering	Electrical Engineering	Master's degree in Engineering / Technology in relevant discipline or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU OR Bachelor's degree in Engineering / Technology in relevant discipline or equivalent with a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.

Academic Department	Disciplines Offered	Discipline Specific Eligibility Criteria
Electronics & Communication Engineering	Electronics and Communication Engineering	<p>Master's degree in Engineering/Technology in relevant discipline or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU</p> <p style="text-align: center;">OR</p> <p>Bachelor's degree in Engineering/Technology in relevant discipline or equivalent with a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.</p>
Environmental Engineering	Environmental Engineering	<p>Master's degree in Engineering / Technology / Sciences / Management in the relevant discipline (Environmental Engineering / Civil Engg. / Biotechnology / Chemical Engg. / other relevant branch) or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU</p> <p style="text-align: center;">OR</p> <p>Bachelor's degree in Engineering / Technology in relevant discipline or equivalent with a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.</p>
Humanities	1.English	Master's degree in Sciences/ Management/Humanities and Social Sciences in relevant discipline or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU.
	2.Economics	Master's degree in Sciences/ Management/Humanities and Social Sciences in relevant discipline or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU.
Information Technology	Information Technology	<p>Bachelor's degree in Engineering/Technology and Master's degree in Engineering / Technology in Computer Science and Engineering / Software Engineering / Information Technology/ Mathematics and Computing / Electronics and Communication Engineering or equivalent with a minimum 55% in aggregate or equivalent CGPA as determined by DTU</p> <p style="text-align: center;">OR</p> <p>Bachelor's degree in Sciences/Computer Applications and Master's degree in Computer Applications (with Mathematics at B.Sc./B.C.A level) with a minimum 75% in aggregate or equivalent CGPA as determined by DTU and having proven research capability</p> <p style="text-align: center;">OR</p> <p>Bachelor's degree in Engineering/Technology in Computer Science and Engineering/Software Engineering/Information Technology/ Mathematics and Computing/Electronics and Communication Engineering. or equivalent with a minimum 75% in aggregate or equivalent CGPA as determined by DTU and having proven research capability</p>
Mechanical Engineering	Mechanical Engineering	<p>Master's degree in Engineering/Technology or a Master's degree by Research in Engineering/Technology in Mechanical with specialization in Thermal/ Production / Design / Industrial Engineering having a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU with Bachelor's degree in Engineering/Technology in Mechanical / Production / Production and Industrial / Mechanical and Automation / Automobile Engineering or Equivalent</p> <p style="text-align: center;">OR</p> <p>Bachelor's degree in Engineering/Technology in Mechanical/ Production / Production and Industrial / Mechanical and Automation / Automobile Engineering or equivalent having a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.</p>

Academic Department	Disciplines Offered	Discipline Specific Eligibility Criteria
Software Engineering	1. Software Engineering	Bachelor's degree in Engineering/Technology and Master's degree in Engineering / Technology in Computer Science and Engineering / Software Engineering / Information Technology/ Mathematics and Computing/Electronics and Communication Engineering or equivalent with a minimum 55% in aggregate or equivalent CGPA as determined by DTU OR Bachelor's degree in Sciences/Computer Applications and Master's degree in Computer Applications (with Mathematics at B.Sc./B.C.A level) with a minimum 75% in aggregate or equivalent CGPA as determined by DTU and having proven research capability OR Bachelor's degree in Engineering/Technology in Computer Science and Engineering/Software Engineering/Information Technology/ Mathematics and Computing/Electronics and Communication Engineering. or equivalent with a minimum 75% in aggregate or equivalent CGPA as determined by DTU and having proven research capability
	2. Computer Science	Bachelor's degree in Engineering/Technology in Computer Science and Engineering/Software Engineering/Information Technology/ Mathematics and Computing/Electronics and Communication Engineering. or equivalent with a minimum 75% in aggregate or equivalent CGPA as determined by DTU and having proven research capability
USME	1. Management	Master's degree in Management/Engineering/Technology/Commerce/ Economics and other behavioral sciences and allied relevant disciplines, or equivalent, with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU. OR Bachelor's degree in Engineering/Technology in relevant discipline or equivalent with a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.
	2. Economics	Master's degree in Economics / Business Economics /Behavioral economics/allied social sciences; humanities and management in relevant disciplines; or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by the DTU OR Bachelor's degree in Engineering/Technology in relevant discipline or equivalent with a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.
	3. Innovation, Entrepreneurship & Venture Development	Master's degree in Management/Entrepreneurship/ allied areas related to innovation, venture development and in relevant disciplines, or equivalent, with a minimum 55% marks in aggregate or equivalent CGPA as determined by the DTU OR Bachelor's degree in Engineering/Technology in relevant discipline or equivalent with a minimum 75% marks in aggregate or equivalent CGPA and having proven research capability.
Design	Design	Master's degree in Design or equivalent with a minimum 55% marks in aggregate or equivalent CGPA as determined by DTU.

In addition to the above Discipline Specific Eligibility Criteria, the following admission guidelines are applicable to all the Disciplines/Departments:

- Five percent (5%) relaxation in marks at the level of qualifying degree will be given to SC/ST category students for determining the eligibility conditions to apply for Ph. D. admission.
 - the applicant possesses the minimum eligibility qualifications for the degree as given as per 5.
 - the applicant is in position to complete mandatory course requirements along with regular counterparts;
- Part-time applicants will be considered as per 4.2 and will be eligible if

- the applicant proves to the satisfaction of the University that his official duties permits him to devote sufficient time to research;
 - facilities for research are available at the applicant's place of work in the chosen field of research or the applicant can spare sufficient time to pursue research in the Department of the Delhi Technological University on daily basis, residing in the vicinity of the University; and
 - he/she will be required to reside at the Delhi Technological University for a period of not less than 6 months during his admission period for the Ph.D. programme. (This condition of minimum residence will be automatically waived for candidates who are working in National Capital Region (NCR) of Delhi or in organisations / institutions located within a distance of 50 km from the Delhi Technological University).
3. The candidate seeking admission to Ph.D. programme as project fellow at Delhi Technological University may be given administrative clearance to seek admission on full time / part time basis subject to recommendations of the concerned Principal Investigator of the said project/centre and approval of the Vice Chancellor, if the candidate is selected in project as project fellow through proper selection. However, he/she must fulfil the minimum eligibility criteria. No relaxation will be given in screening test.
 4. Permanent academic staff of the Delhi Technological University (*Including the academic staff of erstwhile Delhi College of Engineering*) may be given administrative clearance to seek registration on part-time basis subject to recommendations of the concerned head of the department and approval of the Vice Chancellor. However, the applicant must fulfil minimum eligibility criteria. No relaxation will be given in

screening test, except for the special cases as given below at 6(3) in selection procedure.

6. SELECTION PROCEDURE

1. The short listing of applications possessing the minimum educational qualifications, for the purpose of screening test & interview will be done by respective departments in consultation with the Ph.D. Coordinator nominated by the Vice-Chancellor. The entrance test will be of 90 minutes duration comprising of 60 multiple choice questions. The cut off for the same will be decided by the University.

The mode of examination shall be Computer Based Test at DTU Campus.

2. The Departmental Research Committee (DRC) of the respective department shall decide the cut off for the screening test for short listing the candidates for the interview in consultation with Dean PG. Based on the academic record and the performance of the candidates in the interview, the DRC will recommend to the Dean PG the names of candidates.
3. Screening Test shall be waived only for UGC/CSIR/DST/DBT/ICMR/IARI-JRF fellowship holders, all foreign national students including those sponsored by ICCR/MHRD/MEA, and covered under MoU with Delhi Technological University, and faculty of the Delhi Technological University.
4. Moreover, Vice Chancellor may accord exemption from screening test to the Academic/Non-Teaching staff of the Delhi Technological University and the officers of Govt. of India/Govt. of NCT of Delhi, considering the merit of each case. Such candidates shall have an experience of 15 years, age should

not be less than 45 years and will be registered as Part Time candidate without DTU fellowship

5. Students with JRF will also be exempted from the screening test for admission in Part Time - Ph.D. programme without fellowship.
6. All the shortlisted candidates on the basis of screening test are required to come along with 7 to 8 slides of power point presentation on the topic of their interest during the interview.

7. RESERVATION OF SEATS

1. Reservation of seats with fellowships for applicants in each of the categories of the research scholars shall be in accordance with the policies of Govt. of NCT of Delhi. The percentage of reservations for various categories and relaxation in minimum eligibility conditions as applicable for the academic session 2022-23 is tabulated below.

S. No.	Category	Seats reserved	Relaxation in Essential Qualification
1	Scheduled Castes (SC)	15%	5%
2	Scheduled Tribes (ST)	7.5 %	5%
3	OBC	27%	-
4	Persons with Disability	5% (Horizontal)	5%
5	EWS	10%	-

The reservations for persons with disabilities will be implemented department wise. Candidates seeking admission must fulfil the eligibility conditions as detailed earlier. The 5% reservation horizontally in seat matrix for persons with disability may be allocated as follows:

Against the seats identified for each disability, of which, one percent each shall be reserved for persons with benchmark disabilities under clauses (a), (b), and (c) and one percent, under clauses (d) and (e).

- a. Blindness and low vision;
 - b. Deaf and hard of hearing;
 - c. Locomotor disability including cerebral palsy, leprosy cured, dwarfism, acid attack victims and muscular dystrophy;
 - d. Autism, intellectual disability, specific learning disability and mental illness;
 - e. Multiple disabilities from amongst persons under clauses (a) to (d) including deaf-blindness.
2. Physically handicapped applicants are permitted 5% marks or equivalent CGPA relaxation in eligibility requirement in line with the policies of Govt. of NCT of Delhi. They will not be allowed any other relaxation beyond this limit even if they belong to SC/ST category.
 3. Detailed seat matrix (i.e., seats with DTU fellowship) indicating seats in various departments under different categories is available at Annexure-1.

8. APPLICATION PROCESS

For admission to Ph.D. programmes 2022, all candidates need to register and fill the application ONLINE only by accessing www.dtu.ac.in from November 04, 2022 to November 22, 2022. The application process is completed only when a print out of the filled ONLINE application form is taken after paying online the registration fee. The candidate must bring a duly signed copy of the same along with two good quality photo (**same as uploaded on online application form**) affixed in the appropriate place on the form on the day of interview.

Candidates are requested to ensure that they must fulfil all such requirements

before filling and applying for such programmes as their choices. Incomplete application due to any reason is liable for rejection by the University. In this regard, no communication will be entertained.

Application Fee

The registration fee of Rs.1500/- for all categories is to be paid online through credit/debit card/net banking at the time of registration and choice filling. The registration shall not be complete without the payment of registration fee which is non-refundable and would not be adjusted towards any other fee. A convenience charge (online transaction) will be extra as per banking gateway on every online registration fee payment. **If a candidate wishes to apply for admission in a programme offered by different departments then he/she will have to register separately in that department by paying separate online registration fee.**

9. Information about Academic Departments

1. Department of Applied Chemistry

The department aims to provide state-of-art knowledge and practical skills to the UG and PG students in the diverse subjects of Chemistry, Chemical Engineering and Polymer Technology. The department runs four year course of B. Tech Chemical Engineering and post graduate course in Chemistry and Polymer Technology. The Department has well-established laboratories in Applied Chemistry, Polymer Science and Chemical Technology. The department has undertaken and completed successfully large numbers of research and industry projects funded by AICTE, CSIR, UGC, DRDO, DST, BARC etc. Active national and International

collaborations for R&D activities in different fields have been established by the department.

Research Areas: Chemistry including synthetic organic chemistry, Bio inorganic chemistry, Bio organic chemistry, Inorganic Chemistry, Material Chemistry, Green Chemistry Cheminformatics; Medicinal Chemistry; including gene delivery applications, Bio Materials, Drug Delivery systems; Polymer Science including fiber Technology, Conducting Polymers, Composites, Hydrogels: Chemical Engineering including Reaction engineering, Multi phase reactor systems and design, Pollution abatement technology and gene; Advance materials development, Separation processes, Transport Phenomena, Pharmaceuticals sciences, Food Science.

2. Department of Applied Mathematics

The Department runs a four-year B. Tech. programme in Mathematics & Computing. This programme is an amalgamation of Mathematics with Computer Science and Financial Engineering. More than 25 research students are registered in the Department for Ph. D programme. The department has a team of committed faculty members from the disciplines of Pure Mathematics, Applied Mathematics, Computer Engineering, Statistics and Operation Research.

Research Areas: Information Theory, Graph Theory, Discrete Mathematics, Numerical Analysis, General Relativity and Cosmology, Optimization Technique, Complex Analysis, Mathematical Modelling, Approximation Theory, Stochastic Processes, Fuzzy logic and optimization, Algebra and

Mathematical Finance, Natural Language Processing (NLP) and Artificial Intelligence (AI).

3. Department of Applied Physics

Applied Physics Department is providing cutting edge research, innovation and education in the emerging areas of science and technology. Department offers the undergraduate academic programme in Engineering Physics and Postgraduate program, M. Tech in Material Science and Technology, M. Sc. in Physics and one Interdisciplinary M. Tech. programme in Microwave and Optical Communication Engineering (MOCE) is offered from the Department in association with Electronics and Communication Engineering Department. The department has well-equipped state of art laboratories for undergraduate, postgraduate and Ph.D. students. Faculties of the department are actively involved in National and International collaborations for R & D activities.

Research Areas: Nanotechnology: Carbon Nanotube / Carbon Nano fibre and Graphene. Plasma Physics / Dusty plasma / THz Radiation Emission / High power microwave devices, Photonics and Photonic Crystals. Theoretical Condensed Matter Physics, Density Functional Theory, Heusler alloys based materials for Spintronics and energy application, Topological insulators and Low dimensional Systems. Glass Science and Technology Phosphors, Photoluminescence, Organic & Nano - Material, Time - resolved spectroscopy, Microelectronic Devices-FinFETs, Tunnel FETs, Nanowires, MOSFETs - Application Oriented Modeling and Simulation, Waveguide based devices. Fibre and Integrated optics, Luminescent

Material, Material science, Experimental Lithium Ion battery, Multiferroic materials, Atomic physics, Gas sensors, Atmosphere Science, Memory Devices, CNTFET and Graphene FET Devices, CNTFET based Biosensors.

4. Department of Biotechnology

The main objective of the department is to provide academic training and conduct research in the interdisciplinary areas of biotechnology with particular emphasis on extending the knowledge generated from these studies towards the development of technologies of commercial significance.

The Department is running postgraduate programmes in Bioinformatics and Industrial Biotechnology. Department of Biotechnology is also running research oriented Ph.D. programme. The department has undertaken sponsored projects funded by ICMR, CSIR, DST, UGC, etc. The department has 10 state-of-the-art laboratories.

Research Areas: Aquaculture, Algal Biotechnology, Bioremediation, Biosensor, Functional Genomics, Genome informatics, Immunology, Immunostimulation, Molecular Neuroscience, Nano biotechnology, Neuro-oncology, Radiation Biology, Water Quality Management.

5. Department of Civil Engineering

The Department offers undergraduate programme with an intake of about 120. The post graduate Programmes are offered in Hydraulics and Water Resource and Engineering, Structural Engineering, Environmental Engineering, and Geotechnical Engineering with the intake of about 90 students. The Department is well equipped with

laboratories related to Structure, Concrete testing, Soil Mechanics, Highway Engineering, Experimental Stress Analysis, etc. The department lays greater emphasis on quality research of industrial design and development, Structural Engineering and Structural Dynamics.

Research Areas: Structural Engineering, Concrete Technology, Cementitious Materials, Prestressed Concrete, Tall Structures and Rehabilitation of Structures, Geotechnical Engineering, Rock Mechanics, Soil Mechanics, Geo-Environment Engineering, Water Resources Engineering, Pavement Engineering. Hyper Spectral Microwave and LIDAR Remote Sensing.

Multidisciplinary Centre for Geoinformatics

Geoinformatics / Geospatial Technologies include Earth Observation (EO) Technologies, Remote Sensing (RS), Geographic Information System (GIS), Global Navigation Satellite System (GNSS) etc. Geoinformatics is described as the science and technology dealing with the structure and character of spatial information, its capture, classification, quantification, storage, processing, portrayal, dissemination, and all the other aspects necessary to secure optimal use of this spatial information. Geoinformatics is essentially a multidisciplinary subject and different aspects of this subject are dealt by different branches of science and technology. For example, development of sensors / resolution / payload / energy consumption etc are dealt by experts in electronics, image processing algorithms and extraction of information etc are dealt by experts in computers and information technology, and

various sustainable development applications are dealt by experts in the field of civil and agriculture engineering. Multidisciplinary Centre for Geoinformatics (MCG) has been working with the objective to provide education, research and consultancy in the field of Geoinformatics and associated Geospatial Technologies. The Centre is currently working on various projects / fellowships awarded by Department of Science and Technology (DST), New Delhi, Space Applications Centre (SAC), ISRO, Ahmedabad and National Mission on Himalayan Studies (NMHS), Almora etc. Besides, the Centre is also running an M.Tech. programme in Geoinformatics.

Research Areas: The Centre proposes to undertake research and consultancy projects in a wide ranging multidisciplinary subjects involving Geoinformatics/ Geospatial Technologies. Major areas of research, however are, Defense, Security and Intelligence, Water Resources and Glaciology, Urban Infrastructure Development, Planning and Urban Transportation Systems, Earth Sciences, Oceanography, Soil and Geosciences (Geomorphology & Geology), Environment, Health, Forest, Atmosphere, Meteorology, Climate Change and Pollution, Geohazards and Disaster Management, Satellite Image Processing and Photogrammetry, GNSS and Geographical Information System. Imaging & Non-Imaging Sensor Development.

6. Department of Computer Science and Engineering

The Department of Computer Science and Engineering endeavours to provide the thrill of a corporate and R&D environment with a planned focus on industrially

relevant projects and technology incubation. The department has been offering two M.Tech level programs in Computer Science and Engineering and Artificial Intelligence. The department has elite faculties from premier Institutes. Department has developed state of the art laboratories in the various fields of Computer Engineering –Computer Architecture Lab, Network Lab, Web Designing Lab, Computation and Programming Lab, Operating System Lab, Artificial Intelligence Lab, Machine Learning Research Lab, Internet of Things Lab and many others. The department offers Doctoral (Ph.D) degree programs in diverse recent areas and a large number of problems have been taken up in those collaborations (like Samsung Research Lab etc.) with industries. The department has successfully fetched projects for National and International organizations.

Research Areas: Machine Learning, Artificial Intelligence, High Performance Computing, Mobile Computing, Soft Computing, Optimisation techniques, Parallel Computing, Cloud Computing, Internet of Things, Wireless Sensor Networks, Quantum Computing, BlockChain, Nature Inspired Optimisation, Virtual and Augmented Reality, Web Technology, Image Processing, Evolutionary Computing, Big Data, Computer Vision, Steganography, Network Security, Information Security, Software Defined Networks, Software Engineering

7. Delhi School of Management

DSM aims at extending the seven-decade long legacy of Delhi College of Engineering by incubating and developing techno-managers, who are adept

at identifying pertinent and critical business problems and apply their technical skills and competencies in solving those issues. DSM offers dual specialization in MBA programme and offers post-doctoral degree programme. It focuses on developing a strong foundation and right attitude by teaching general subjects, Technical and Functional area of Management.

Research Areas: Managerial themes such as E-Governance, Information Technology Management & Strategy, Marketing Management, Distribution and Retail Management, Organizational Behaviour & Human Resource Management, Corporate Governance and Ethics, Public Policy and Governance, Accounting and Finance (including but not limited to CEO succession, Accounting Theory, Accounting Standards, Directors' Remuneration, Valuation of Human Resources and Intangibles), Portfolio Management, Mergers and Acquisition, Corporate Restructuring, Knowledge Management, International Business and Trade, Supply Chain Management and Operations Management.

8. Department of Design

DTU has started Department of Design from academic year 2018-19 with a vision of pursuing excellence in design thinking, design research and design practice for the betterment of society or the ecosystem we live in. The department of design would concentrate on developing a knowledge based design professionals who would become the problem solvers, and who can effectively use different design methodology. They would develop their innovative and aesthetic sensibilities into making a coherent and appropriate research. To develop centres of excellence in design research and practice, the

department aspires to initiate Ph.D. programme as per the expertise and strength of the department.

Research Areas: Product Design, Industrial Design, Visual Communication, Interaction Design.

9. Department of Electrical Engineering

The goal of the department is to provide quality education at undergraduate and post graduate levels and undertake cutting edge research in various areas of Electrical Engineering. The department also aims to develop active collaboration with various industries in the power sector. The department has an annual intake of 300 and 60 students in the B.Tech programmes in Electrical Engineering and B.Tech (Evening), respectively. At the post graduate level, the department is offering three M.Tech programmes in Control and Instrumentation, Power Systems and Power Electronics and Systems. In addition to the above the department offers regular Ph.D. programmes in various areas of specialization in Electrical Engineering. The department is involved in carrying out several sponsored R&D projects funded by national agencies like AICTE, DST etc. The department is establishing a new Centre of Excellence for Electrical Vehicle and Related Technologies (COE for EVRT) which is funded jointly by Govt. of NCT of Delhi and Delhi Technological University.

Research Areas: Power system optimization, AI Techniques, Modelling & Analysis of Electrical machines, Power Electronics & Drives, Intelligent control of nonlinear systems, FACTS, SSR, Voltage stability, Power quality improvement, Grid integration, Micro grid, Smart

grid, Analog Signal processing (Linear and Non linear), Power system & control, System Engineering, Power System Analysis, Power electronics, Renewable energy, HVDC, Power systems restructuring, AI in Electricity market forecasting, Wind energy forecasting, Embedded system, Information security, Design of power supply, Electric traction systems, Energy conversion, IOT enabled electrical system, Charging infrastructure for EVs, Battery management system (BMS), Electric drives & control, EV retrofitting.

10. Department of Electronics and Communication Engineering

The vision of the department is to foster education, innovation and research in the frontline areas of Electronics and Communication Engineering for the sustainable growth of nation and service to the mankind. The department offers UG and PG programmes with annual intake of 240 students in the B. Tech programme in Electronics and Communication Engineering and the PG Programmes include M. Tech. in VLSI Design and Embedded Systems; Signal Processing and Digital Design; and Microwave and Optical Communication. The Department has focused attention on quality research and offers Ph. D. Programmes in the area of Electronics and Communication namely VLSI, DSP, Image Processing, Micro strip antenna design, Sensor Networks, Analog and digital system design. The Department also has active MoUs with academic institutions, research labs and the industrial sector to ensure that the students and faculty can get ample opportunities to work on real-world problems in collaboration through these MoUs.

Research Areas: VLSI Design, Computer Vision, Pattern Recognition, Object Tracking, Image Processing, Human Computer Interaction, Wireless Sensor Network, Microwave Engineering, Antenna Design, Digital Signal Processing, Wireless Communication, RF Devices, Nano-electronics, Network Security, and Cloud Computing, Optical Communication, R F Circuit Design.

11. Department of Environmental Engineering

The Department of Environmental Engineering have been offering M. Tech. in Environmental Engineering Degree and B. Tech in Environmental Engineering. The department conducts cutting-edge research, in developing the vital areas that address societal needs for environmentally sustainable life style and offer doctoral degree. In addition to this, the department also provides opportunity to working engineers for upgrading their qualification under Continuing Education Programme on part time basis for PG level. The departmental laboratories (Water Pollution, Air & Noise Pollution, Microbiology, GIS & Remote Sensing and Solid Waste) for teaching and research are among the best in the nation, providing opportunities for hands-on experience for all students.

Research Areas: Water Pollution, Waste Water Treatment, Environment Modelling, Phytoremediation, Water Management, Air Pollution, Geo-environmental Engineering, Solid Waste Management and Noise Pollution.

12. Department of Humanities

The Department of Humanities offers courses in Communication Skill, English, Economics and

Accountancy for engineering and management students in an effort to train them for the global economic environment of the 21st Century. Besides giving them in-depth understanding of the labour market in which they are expected to work as well as emerging employment trends among engineers, students are sensitized towards the specific technological needs of urban slums and rural areas and socio economic impact of engineering projects on the masses. The Department has competent faculty members with a high degree of excellence who keeps pace with the current developments in their fields of specialization for the fulfilment of its teaching and research goals.

Research Areas: Women Education and Inclusive Growth, Banking and finance, International Trade and other areas of economics.

13. Department of Information Technology

The department offers an undergraduate (B. Tech.) course in Information Technology with an intake of 180 students every year. To meet the growing demands of present day technologies, the department has started M.Tech. degree in Information Systems in 2009-10 with an intake of 25. The curriculum of the department is designed in a way so as to provide the students with fundamental concepts and learning tools related to outcome based studies. The designed courses mainly emphasize on all basic subjects such as operating systems, computer architecture and design, software development, networking, multimedia and graphics, analog and digital communications and computer communications, compiler design, theory of computation, etc. The department is also imparted a

specialized knowledge on analysis and design of Information system, Information security systems, mobile computing, Internet of Things, cloud computing & security, soft computing, artificial intelligence, digital signal processing, computer vision and expert systems and web engineering. The department has developed the various state-of-the-art laboratories in the fields of Information Technology such as Computer Networks Lab, Web Engineering Lab, Programming Lab, Information and Security Lab, Biometric Research Lab, and many others.

Research Areas: Pattern Recognition, Soft computing, Biometric security system, Neural Networks/ Deep learning, Fuzzy-Neural Networks, Computer Vision, Big data Analytics Web Mining Internet Technologies, Data Mining Social Networks Machine Learning Human behaviour, Multimedia Systems Human Computer interaction, Image processing, Evolutionary Computing, Wireless Ad-hoc & Sensor Networks, Internet of Things, Software Defined Networking, Network Security, Information Security, Internet of Robotics Things, Pattern Mining and Digital Forensics, HCI

14. Department of Mechanical Engineering

The Department of Mechanical Engineering also offers undergraduate and Postgraduate courses with specialization in

- a) Thermal Engineering
- b) Production Engineering.
- c) Industrial Engineering and Management
- d) Computer Aided Analysis and Design
- e) Energy Systems and Management

Ph. D Programmes in all fields of Mechanical Engineering are also offered. The department possesses modern laboratories equipped with latest experimental set-ups and research facilities for instrumentation, experimental stress analysis, strength of materials, fluid mechanics, tic, engines, automotive engineering, robotics, heat transfer, solar energy, flexible manufacturing system, computational fluid dynamics supported by Software like view-flex, CAD-CAM and I.e. engine design. Cad lab has Softwares like NX-LAD, NXCAM, AUTOCAD Inventor, Catia, Techomatix, Abus, Iadino, NX-Narran, Hyper mesh, hyper works, MDADAMS, Dynaform etc. The department has many research projects which are sponsored by different government organizations.

Research Areas: Turbo Machinery, Fluid Mechanics, Power Plant b Engineering, Refrigeration and Air conditioning, Computational Fluid Dynamics, Solar Energy, Bio Fuels, Power Plant, Industrial Engineering & Supply Chain Management, Robotics, CAD/CAM, Welding, Production Engineering, System Dynamics, Structural Vibration, Modeling & Simulation, Automation, Advanced Manufacturing Process, Human Factor Engineering, Quality Engineering.

15. Department of Software Engineering

The Department of Software Engineering is dedicated to produce high quality graduates and skilled software engineers/professionals who can develop high quality and cost-effective software systems.

The Discipline of Software Engineering was introduced in the year 2009. The Department is

currently running a B.Tech program in Software Engineering with an intake of 180, two M.Tech programs in Software Engineering and Data Science and offers Ph.D. in the Discipline of Computer Science and Software Engineering. All the software engineering programs are well designed keeping in view the industry demands. The programs are designed to build the analytical and practical capabilities of students in the design and development of the software and lays emphasis on following well defined and systematic approach for meeting the growing demands and requirements of the software industry. The department has state of art labs consistent with industrial standards which provide a hands-on experience to the students.

Research Areas: Empirical software engineering, machine learning, software quality and testing, search based software engineering, web engineering, opinion mining, social web, predictive modeling, machine learning and Deep learning for mobile healthcare, telemedicine, internet of things, cryptography

16. USME

USME (University School of Management and Entrepreneurship) The Vision of the USME is to develop and nurture the spirit of management leadership and

entrepreneurship for the good of society. The mission focuses on a portfolio of Programmes around entrepreneurship and cutting edge areas in management, and offers courses at the undergraduate and postgraduate levels: MBA, MBA-Business Analytics, MBA-Family Business and Entrepreneurship, MBA- Innovation Entrepreneurship and Venture Development, BA(H) Economics and BBA.

The focus of the department is to create a practice school in the area of management which is based on research and leads back to Programmes with a strong focus on entrepreneurship, employability, skill development and holistic, experiential learning.

Research Areas: The research focus of USME faculty covers diverse areas within management, economics and analytics. The management research focus is in the areas of work performance management, CRM and behavioural models. The research interests in the area of analytics are in optimization and multi-criterion decision models, quantitative models of innovation diffusion and analytics, social networks and collective intelligence. Faculty in economics stream have research focus in the area of international banking and market structures and health economics and capital markets.

10. Fee and Documents to be submitted

The selected candidates will be required to pay the admission fee as per the details given below:

S. No.	Particulars	Annual Fee			
		At the time of Admission		2 nd year onwards	
		A	B	A	B
	Code				
1.	Tuition Fee	Nil	12000	Nil	6000
2.	Non Govt. Component				
2.1	Student Welfare Fee (Co-curricular activities, Training & placement, Extra Curricular Activities, Annual Gathering, Students welfare, Institutional Development, outsourcing, conference, seminar, workshop, innovative projects, skill development activities and, Misc. Expenditure on Unspecified Items)	6000	6000	4500	4500
2.2	Facilities & Services Charges (Research initiatives, training programmes, Awards, automation, facilities, entrepreneurship activities and any misc. expenditure on unspecified items)	2500	2500	1000	1000
2.3	Economically weaker section fund	1000	1000	1000	1000
2.4	Examination fee (Examination Infrastructure strengthening, expenditure on examination activities, confidential printing etc.	7000	7000	-	-
2.5	Premium amount for mediclaim of student (per-annum)	700	700	700	700
	GRAND TOTAL	17200	29200	7200	13200

S. No.	Particulars	Code
1.	The teaching/non-teaching/academic staff of the Delhi Technological University (including the teaching/non-teaching/ academic staff of erstwhile Delhi College of Engineering) and officers of Department of Technical and Higher Education, Govt. of NCT of Delhi as in R.19 (i)	A
2.	Project staff pursuing Ph.D. as in R.19(ii)	
3.	Other Full Time / Part Time candidates	B

11. Withdrawal / Refund Policy

S. No.	Percentage of Refund of aggregate fee*	Point of Time when Application for Withdrawal of admission is received
1	100%	Application for withdrawal of admission received upto 28.12.2022
2	80%	Application for withdrawal of admission received from 29.12.2022 to 31.12.2022
3	50%	Application for withdrawal of admission received from 01.01.2023 to 04.01.2023
4	NIL	Application for withdrawal of admission received after 04.01.2023

Original Documents to be submitted for verification at the time of Admission

- a. Printed copy of online registration application
- b. All the semesters Mark sheet/grade card / provisional / degree certificates beginning from first degree towards proof of qualification.
- c. All the candidates will be required to produce the proof of having passed the qualifying degree with the required percentage of marks or CGPA latest by **January 31, 2023**, failing which their admission shall be cancelled.
- d. Caste Certificate in the case of SC/ST/OBC-NCL candidates issued by the respective State Government as per format annexed at 2.
- e. Authorised Doctor's Certificate with disability descriptions in the case of Person with Disabled (PwD) candidates as per format annexed at 3.
- f. Income Certificate of EWS candidates as per format annexed at 4.
- g. NOC for part time candidates as per format annexed at 5.
- h. Original UGC- JRF/NET/CSIR/ DAE-JEST or other fellowship award.
- i. Project Co-ordinator's certificate in the prescribed format
- j. Date of Birth Proof
- k. Two passport sized recent photographs
- l. Copy of Cancelled Cheque
- m. Copy of Adhaar Card

IMPORTANT INSTRUCTIONS

1. The candidates are advised to read each and every instruction given in this Information Brochure very carefully before applying Online.
2. All entries should be carefully made while applying online. DTU will not be responsible for wrong entries. Candidates shall be sole responsible for the correctness and authenticity of the information / documents provided in the online application.
3. Online application found incomplete in any form will be summarily rejected. No

correspondence / communication will be entertained in this regard.

4. The last date for submission of online application shall not be extended. Accordingly, no request shall be entertained for accepting the application after the last date. Therefore, candidates are advised to submit their application well in advance and not to wait for the last moment.
5. The University has the right to cancel, at any stage, the admission for the candidate who is found admitted to a course to which he/she is not entitled, being unqualified or ineligible in accordance with the statues and regulations in force.
6. The list of the shortlisted candidates for screening test, interview and finally selected for admissions to Ph.D. programme will be displayed on the DTU website: www.dtu.ac.in
7. Candidates have to bring a valid photo-identity card for the purpose of written test along with the printed application form.
8. There is no need to send any part of application form to DTU by post.
9. Incomplete applications are likely to be rejected.
10. No separate call letter will be dispatched.
11. The candidates are advised to make their own arrangements for travelling and lodging accordingly. They must come prepared for admission (in case they are selected) as per the schedule.
12. Candidate should check the University website for results / important announcements.
13. Candidates called for the interview should bring with them (i) Photo ID Card, (ii) Printed copy of the application submitted online, (iii) Thesis / dissertation / report / publications (iv) copy of certificates and mark-sheets.
14. The candidates may contact faculty members/Head of the concerned academic departments for selecting their area of research work.

ANNEXURE-1

Vacant Seats for full time Ph.D. programme with University Scholarship for the Session: January 2023 (Winter Session)								
Name of the Department	Discipline Offered by the Departments	Code of the Department	General	EWS	OBC	SC	ST	Total Seats Vacant
Applied Chemistry	Chemistry	AC	1	-	1	-	-	2
	Chemical Engineering		-	1	-	-	-	1
PwD	-		-	-	-	-	-	-
Applied Physics	Physics	AP	3	-	1	-	-	4
	Engineering Physics		-	-	1	1	-	2
PwD	-		-	-	-	-	-	-
Applied Mathematics	Mathematics	AM	-	-	1	1	-	2
	Mathematics and Computing		1	-	-	-	-	1
PwD	-		-	-	-	-	-	-
Biotechnology	Biotechnology	BT	1	-	-	-	-	1
PwD			-	-	-	-	-	
Civil Engineering	Civil Engineering	CE	1	-	1	2	-	4
PwD			-	-	-	-	-	
Computer Science & Engineering	Computer Science and Engineering	CSE	2	1	2	-	-	5
PwD			-	-	-	-	-	
Electronics & Communication Engineering	1.Electronics and Communication Engineering	ECE	5	1	3	1	1	12
PwD			-	-	-	-	1	
Electrical Engineering	1.Electrical Engineering	EE	5	1	2	1	-	10
PwD			-	-	-	-	1	
Environmental Engineering	1. Environmental Engineering	ENE	1	-	1	-	-	2
PwD			-	-	-	-	-	
Mechanical Engineering	1.Mechanical Engineering	ME	6	-	3	1	1	12
PwD			-	-	-	1	-	
Delhi School of Management	1.Management	DSM	2	-	1	-	1	4
PwD			-	-	-	-	-	
Information Technology	1.Information Technology	IT	2	-	1	-	-	3
PwD			-	-	-	-	-	
Humanities	1. Economics	HUM	-	-	-	-	-	NIL
PwD			-	-	-	-	-	
USME	1.Management	USME	1	-	1	-	-	2
	2.Economics		-	-	-	1	-	1
	3.Entrepreneurship Innovation & Venture Development		-	-	-	1	-	1
PwD	-		-	-	-	-	-	-
Total:			31	4	19	10	5	69

Reservation Policy: OBC-27%, SC- 15%, ST-7.5%, EWS-10%, PWD: 5% Horizontal

* Non availability of suitable candidate in the discipline of the Department(s), the seat may be converted in other discipline of the Department.

ANNEXURE-2

AUTHORITIES WHO CAN ISSUE CASTE/TRIBE CERTIFICATE

SC/ST/OBC candidates should submit certificate issued by any of the following authorities:

District Magistrate/Additional District Magistrate/Collector/Deputy Commissioner/Additional Deputy Commissioner/Deputy Collector/1st Class Stipendiary Magistrate/City Magistrate/Sub-Divisional Magistrate/Taluka Magistrate/Executive Magistrate/Extra Assistant Commissioner/Chief Presidency Magistrate/Additional Chief Presidency Magistrate/Presidency Magistrate/Revenue Officer not below the rank of Tehsildar/Sub-Divisional Officer of the area where the candidate and/or his/her family normally resides/Administrator/Secretary to Administrator/Development Officer (Lakshadweep Island).

(Certificate issued by any other authority will not be accepted.)

Prescribed Format for OBC Certificate

FORM OF CERTIFICATE TO BE PRODUCED BY OTHER BACKWARD CLASSES

This is to certify that Shri / Smt. / Kum. _____

_____ Son/Daughter of Shri / Smt. _____

_____ of Village/Town _____

District/Division _____ in the State belongs to the _____

_____ Community which is recognized as a backward class under:

- | | |
|--|---|
| i. Resolution No. 12011/68/93-BCC(C) dated 10/09/93 published in the Gazette of India Extraordinary Part I Section I No. 186 dated 13/09/93. | BCC dated 6/12/96 published in the Gazette of India Extraordinary Part I Section I No. 210 dated 11/12/96. |
| ii. Resolution No. 12011/9/94-BCC dated 19/10/94 published in the Gazette of India Extraordinary Part I Section I No. 163 dated 20/10/94. | v. Resolution No. 12011/13/97-BCC dated 03/12/97. |
| iii. Resolution No. 12011/7/95-BCC dated 24/05/95 published in the Gazette of India Extraordinary Part I Section I No. 88 dated 25/05/95. | vi. Resolution No. 12011/99/94-BCC dated 11/12/97. |
| iv. Resolution No. 12011/96/94-BCC dated 9/03/96. (v) Resolution No. 12011/44/96- | vii. Resolution No. 12011/68/98-BCC dated 27/10/99. |
| | viii. Resolution No. 12011/88/98-BCC dated 6/12/99 published in the Gazette of India Extraordinary Part I Section I No. 270 dated 06/12/99. |

- ix. Resolution No. 12011/36/99-BCC dated 04/04/2000 published in the Gazette of India Extraordinary Part I Section I No. 71 dated 04/04/2000.
- x. Resolution No. 12011/44/99-BCC dated 21/09/2000 published in the Gazette of India Extraordinary Part I Section I No. 210 dated 21/09/2000.
- xi. Resolution No. 12015/9/2000-BCC dated 06/09/2001.
- xii. Resolution No. 12011/1/2001-BCC dated 19/06/2003.
- xiii. Resolution No. 12011/4/2002-BCC dated 13/01/2004.
- xiv. Resolution No. 12011/9/2004-BCC dated 16/01/2006 published in the Gazette of India Extraordinary Part I Section I No. 210 dated 16/01/2006.

Shri / Smt. / Kum. _____

and/or his family ordinarily reside(s) in the _____ District /

Division of _____ State. This is also to certify that he/she does not

belong to the persons/sections (Creamy Layer) mentioned in Column 3 of the Schedule to the Government of India, Department of Personnel & Training O.M. No. 36012/22/93-Estt.(SCT) dated 08/09/93 which is modified vide OM No. 36033/3/2004 Estt.(Res.) dated 09/03/2004.

Dated: _____

District Magistrate / Deputy Commissioner / Competent Authority
Seal

NOTE:

- a. The term 'Ordinarily' used here will have the same meaning as in Section 20 of the Representation of the People Act, 1950.
- b. The authorities competent to issue Caste Certificates are indicated below:
- District Magistrate / Additional Magistrate / Collector / Deputy Commissioner / Additional Deputy Commissioner / Deputy Collector / Ist Class Stipendiary Magistrate / Sub-Divisional magistrate / Taluka Magistrate / Executive Magistrate / Extra Assistant Commissioner (not below the rank of Ist Class Stipendiary Magistrate).
 - Chief Presidency Magistrate / Additional Chief Presidency Magistrate / Presidency Magistrate.
 - Revenue Officer not below the rank of Tehsildar' and
 - Sub-Divisional Officer of the area where the candidate and / or his family resides.

Declaration/undertaking - for OBC Candidates only

I, _____ son/daughter of Shri _____

_____ resident of village/town/city _____

district _____ State _____ hereby declare that I

belong to the _____ community which is recognized as a backward class

by the Government of India for the purpose of reservation in services as per orders contained in Department of Personnel and Training Office Memorandum No.36012/22/93- Estt. (SCT), dated 8/9/1993. It is also declared that I do not belong to persons/sections (Creamy Layer) mentioned in Column 3 of the Schedule to the above referred Office Memorandum, dated 8/9/1993, which is modified vide Department of Personnel and Training Office Memorandum No.36033/3/2004 Estt.(Res.) dated 9/3/2004.

Signature of the Candidate

Place: _____

Date: _____

ANNEXURE-3

Certificate for Person with Disability to be issued by Medical Board from Government Hospital

Name of the candidate: Mr./Ms.* _____

Father's Name: _____

Permanent Address: _____

Percentage loss of earning capacity (in words) whether the candidate is otherwise able to carry on the studies and perform the duties of an engineer/architect satisfactorily: _____

Name of the disease-causing handicap: _____

Whether handicap is temporary or permanent: _____

Whether handicap is progressive or non-progressive: _____

The candidate is FIT / UNFIT to pursue further studies.

(*Strike out whichever is not applicable)

Member

Member

Principal Medical Officer
(Orthopaedic Specialist)

Date:

Seal of Office:

NOTE:

1. The medical board must have one orthopaedic specialist as its member.
2. Candidate having temporary or progressive handicap will not be considered against the seats.

ANNEXURE-4

Government of.....

(Name & Address of the authority issuing the certificate)

INCOME & ASSET CERTIFICATE TO BE PRODUCED BY ECONOMICALLY WEAKER SECTIONS

Certificate No. _____

Date: _____

VALID FOR THE YEAR _____

This is to certify that Shri/Smt./Kumari _____ son/daughter/wife of _____ permanent resident of _____

Village/Street _____ Post Office _____ District _____

in the State/Union Territory _____ Pin Code _____

whose photograph is attested below belongs to Economically Weaker Sections, since the gross annual income* of his/her family** is below Rs. 8 lakh (Rupees Eight Lakh only) for the financial year _____. His/her family does not own or possess any of the following assets***:

- i. 5 acres of agricultural land and above;
- ii. Residential flat of 1000 sq. ft. and above;
- iii. Residential plot of 100 sq. yards and above in notified municipalities;
- iv. Residential plot of 200 sq. yards and above in areas other than the notified municipalities.

Shri/Smt./Kumari _____ belongs to the _____ caste which is not recognized as a Scheduled Caste, Scheduled Tribe and Other Backward Classes (Central List)

Name _____

Signature with seal of Office

Designation _____

*Note 1: Income covered all sources i.e. salary, agriculture, business, profession, etc.

**Note 2: The term 'Family' for this purpose include the person, who seeks benefit of reservation, his/her parents and siblings below the age of 18 years as also his/her spouse and children below the age of 18 years.

***Note 3: The property held by a 'Family' in different locations or different places/cities have been clubbed while applying the land or property holding test to determine EWS status.

INCOME AND ASSET CERTIFICATE ISSUING AUTHORITY

The Income and Asset Certificate issued 'by any one of the following authorities in the prescribed format as given above shall only be accepted as proof of candidate's claim as 'belonging to EWS: -

- i. District Magistrate/Additional District Magistrate/ Collector/ Deputy Commissioner/Additional Deputy Commissioner/ 1st Class Stipendiary Magistrate/ Sub-Divisional Magistrate/ Taluka Magistrate/ Executive Magistrate/ Extra Assistant Commissioner,
- ii. Chief Presidency Magistrate/Additional Chief Presidency Magistrate/ Presidency Magistrate,
- iii. Revenue Officer not below the rank of Tehsildar and
- iv. Sub-Divisional Officer or the area where the candidate and/or his family normally resides.

NO OBJECTION CERTIFICATE

(Required from candidates seeking admission in Ph.D. on Part-Time Basis)
(On the Organization Letter Head)

The undersigned is pleased to permit Mr./Ms. _____
who is working in this organization for the last _____ years and is presently holding the
rank/position of _____ for pursuing the Ph.D. programme at Delhi
Technological University, Delhi with specialization in the following areas:

1. _____ 2. _____

To the best of my knowledge and belief Mr./Ms. bears an excellent moral character.

If selected for admission, the candidate will be permitted and be granted leave of absence
to be present at the University as required by the academic schedule to attend classes/
research work. He/She will continue to remain in service of this organization for the entire
duration of the course.

This organization has a minimum turnover of Rs. 75 crores or above along with standing
commitment to the exemplary standards namely ISO/CMM level 3 or similar standard of
respective area (required for candidates from industry).

Signature of Head of the
Institution/Organization with seal

Place: _____

Date: _____

Name _____

Designation _____



DELHI TECHNOLOGICAL UNIVERSITY

(Formerly Delhi College of Engineering)

Shahbad Daultpur, Main Bawana Road, Delhi – 110042

UNDERTAKING

Name of the Department : _____

Year of Admission : _____

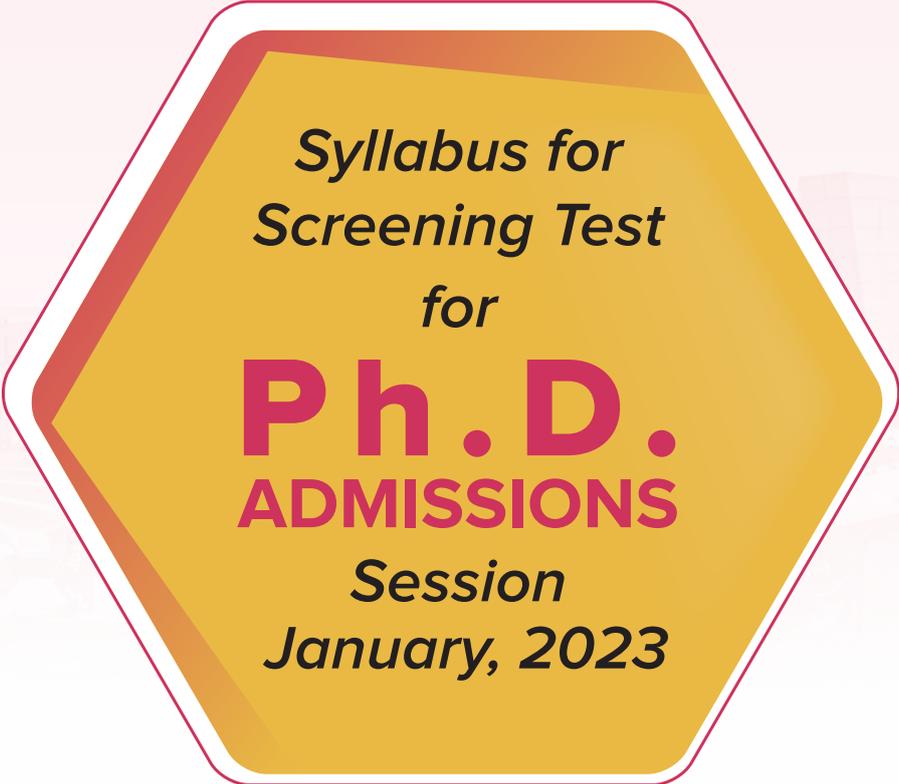
Type of Fellowship : _____

I _____ hereby undertake that in the event of leaving Ph.D/not completing Ph.D due to any exigency/medical reason/personal reason, I shall be liable to return full amount of fellowship & contingency to be disbursed to me from the date of admission to the date of withdrawal.

Name : _____

Roll No.: _____

Signature of Candidates



**Syllabus for
Screening Test
for
Ph.D.
ADMISSIONS
Session
January, 2023**

1. Department of Applied Chemistry

Discipline: Chemistry

Chemical periodicity, structure and bonding, concepts of acids, bases and non-aqueous solvents, main, transition and inner-transition group elements and their compounds including properties, organometallic compounds, cages and metal clusters, bioinorganic chemistry.

Basic principles of quantum mechanics, chemical thermodynamics, electrochemistry, chemical kinetics, photochemical reactions, colloids and surfaces, solid state and polymer chemistry.

IUPAC nomenclature of organic molecules, configurational, conformational isomerism in acyclic and cyclic compounds. Organic reaction mechanism, determination of reaction pathways, common named reactions and rearrangements and applications in organic synthesis. Separation, electro- and thermo analytical methods. Molecular spectroscopy and characterization of chemical compounds by IR, Raman, NMR, EPR, UV-vis, MS, electron spectroscopy and microscopic techniques.

Discipline: Chemical Engineering

Material and energy balance, Chemical Engineering Thermodynamics, Basic concepts of fluid mechanics, flow through pipe, pressure drop calculations, Transport Phenomena, Heat transfer by conduction, convection, radiation, Concepts and design of heat exchangers and evaporators, Basic concepts of mass transfer, Different mass transfer processes and unit operations, Mechanical operations, Chemical reaction engineering: Design of homogeneous and heterogeneous reactors, Chemical process technology, Petroleum refining and petrochemicals. Instrumentation control and optimization, Principles of process economics and cost estimation.

Polymer chemistry, Polymer properties and testing: Determination of molecular weight, thermal, morphological, structural, Mechanical, optical, electrical and environmental properties of polymers, properties and applications of commodity, engineering and speciality polymers, Natural and synthetic rubbers, Polymer blends and composites, biopolymers, Polymer processing: Compression molding, injection molding, blow molding, extrusion, rotational molding, thermoforming, rubber processing.

2. Department of Applied Physics

Discipline: Physics

Section 1: Mathematical Physics

Vector calculus; matrices; similarity transformations, diagonalization, eigenvalues and eigenvectors; linear differential equations: second order linear differential equations and solutions involving special functions; Partial differential equations, complex analysis: Cauchy-Riemann conditions, Cauchy's theorem, singularities, residue theorem and applications; Laplace transform, Fourier series & analysis; Tensors; Numerical methods.

Section 2: Classical Mechanics

Lagrangian formulation: D'Alembert's principle, Euler-Lagrange equation, Hamilton's principle, symmetry and conservation laws; central force motion: Kepler problem and Rutherford scattering; Periodic motion: small oscillations; coupled oscillations and normal modes; rigid body dynamics; Liouville's theorem; canonical transformations, Poisson brackets, Hamilton-Jacobi equation. Special theory of relativity: Lorentz transformations, relativistic kinematics, mass-energy equivalence.

Section 3: Electromagnetism

Electrostatics and magnetostatics, boundary value problems, multipole expansion, Fields in conducting, dielectric, diamagnetic and paramagnetic media, Faraday's law and time varying fields; displacement current; Maxwell's equations; energy and momentum of electromagnetic fields; Propagation of plane electromagnetic waves, reflection, refraction; Electromagnetic waves in dispersive and conducting media.

Section 4: Quantum Mechanics

Wave-particle duality, uncertainty principle; Schrodinger equation; linear vectors and operators in Hilbert space; one dimensional potentials: step potential, finite rectangular well, tunnelling from a potential barrier, particle in a box, harmonic oscillator; two and three dimensional systems: concept of degeneracy; hydrogen atom; Stern-Gerlach experiment, angular momentum and spin; addition of angular momenta; variational method and WKB approximation, time independent perturbation theory; elementary scattering theory, Born approximation; symmetries in quantum mechanical systems; Identical particles; Pauli exclusion principle.

Section 5: Thermodynamics and Statistical Physics

Laws of thermodynamics and their consequences; macrostates and microstates; phase space; ensembles; partition function, free energy, calculation of thermodynamic quantities; classical and quantum statistics; degenerate Fermi gas; black body radiation and Planck's distribution law; Bose-Einstein condensation; first and second order phase transitions, phase equilibria, critical point.

Section 6: Atomic and Molecular Physics

Quantum states of an electron in an atom; Spectra of one-and many-electron atoms; spin-orbit interaction: LS and jj couplings; fine and hyperfine structures; Zeeman and Stark effects; Electronic, rotational and vibrational spectra of diatomic molecules; selection rules; electronic transitions in diatomic molecules, Franck-Condon principle; Raman effect; EPR, NMR, ESR, X-ray spectra; lasers: Einstein coefficients, population inversion, two, three and four level systems.

Section 7: Solid State Physics

Bravais lattices; crystal structures, Miller indices, diffraction methods for structure determination; Reciprocal lattice, bonding in solids; Defects and dislocations; lattice vibrations and thermal properties of solids; free electron theory; band theory of solids; Optical properties of solids; dielectric properties of solid; dielectric function, polarizability, ferroelectricity; magnetic properties of solids; domains and magnetic anisotropy; superconductivity: Type-I and Type II superconductors, Meissner effect, London equation, BCS Theory, flux quantization, Josephson junctions.

Section 8: Electronics

Semiconductors, electron and hole statistics in intrinsic and extrinsic semiconductors; Hall effect, metal-semiconductor junctions; Ohmic and rectifying contacts; PN diodes, bipolar junction transistors, field effect devices; negative and positive feedback circuits; oscillators, operational amplifiers, Opto-electronic devices, Microprocessor and microcontroller basics.

Section 9: Nuclear and Particle Physics

Basic nuclear properties; Nuclear radii and charge distributions, nuclear binding energy, electric and magnetic moments; semi-

empirical mass formula; nuclear models; liquid drop model, nuclear shell model; nuclear force and two nucleon problem; alpha decay, beta-decay, electromagnetic transitions in nuclei; Rutherford scattering, nuclear reactions, conservation laws; fission and fusion; particle accelerators and detectors; elementary particles, Quark model.

Section 10: Optics and Fiber Optics

Interference, diffraction, polarization, Guided wave Optics, Guided Wave Structures, Ray analysis, Modes of planar waveguide, Mode theory for optical fibers, Propagation characteristics of step index fibers, graded index fibers, Signal degradation in optical fiber due to dispersion and attenuation, Optical Sources and detectors for optical fiber communication.

Discipline: Engineering Physics

Section 1: Engineering Mathematics

Linear Algebra: Vector space, basis, linear dependence and independence, matrix algebra, eigenvalues and eigenvectors, rank, solution of linear equations- existence and uniqueness.

Calculus: Mean value theorems, theorems of integral calculus, evaluation of definite and improper integrals, partial derivatives, maxima and minima, multiple integrals, line, surface and volume integrals, Taylor series.

Differential Equations: First order equations (linear and nonlinear), higher order linear differential equations, Cauchy's and Euler's equations, methods of solution using variation of parameters, complementary function and particular integral, partial differential equations, variable separable method, initial and boundary value problems.

Vector Analysis: Vectors in plane and space, vector operations, gradient, divergence and curl, Gauss's, Green's and Stokes' theorems.

Complex Variables: Analytic functions, Cauchy's integral theorem, Cauchy's integral formula, sequences, series, convergence tests, Taylor and Laurent series, residue theorem.

Section 2: Computational Physics

Roots of Non-linear Equation: Roots of equations, Bisection method, Regula Falsi Method or Method of False position, Secant, Newton-Raphson method, Convergence of these methods.

Interpolation: Finite differences and difference operators, Interpolation with equally spaced data points: Newton's forward and backward formulae for interpolation, Central difference: Gauss forward, Gauss Backward, Stirling, Bessels, Everett's formula for interpolation, Interpolation with unequally spaced data points: Divided differences and their property, Newton Divided differences formula.

Integration: Newton-cotes integration formulae, trapezoidal method, Simpson's 1/3-rule, Simpson's 3/8-rule, Boole's and Weddle's Rule.

Numerical solution of ordinary differential equations: Taylor's series method, Picard's method of successive approximation methods, Euler's method, modified Euler's method, Runge-Kutta method, solution of second order and simultaneous differential equations, Application of optimization and variational methods to problem of interest in applied physics.

Section 3: Quantum Mechanics

Wave-particle duality, uncertainty principle; Schrodinger equation; linear vectors and operators in Hilbert space; one dimensional potentials: step potential, finite rectangular well, tunnelling from a potential barrier, particle in a box, harmonic oscillator; two and three dimensional systems: concept of degeneracy

Quantum states of an electron in an atom; Spectra of one-and many-electron atoms; spin-orbit interactions; fine and hyperfine structures; Zeeman and Stark effects; Electronic, rotational and vibrational spectra of diatomic molecules.

Section 4: Engineering Materials

Classification of Materials, Nature of bonding in Materials, Defects in Crystalline Materials, Mechanical, Structural, Electronic, Thermal, Optical Properties and various Applications of Materials .

Section 5: Synthesis and Characterization of Materials

Top down and bottom-up synthesis approach, physical and chemical techniques for material synthesis (sol-gel, hydrothermal etc.), X-Ray Diffraction, Scanning Electron Microscopy, Transmission Electron Microscopy, Atomic Force Microscopy, Photoluminescence Spectroscopy and other spectroscopic techniques.

Section 6: Electronic Devices and Circuits

Semiconductors, metal-semiconductor junctions; Ohmic and rectifying contacts; PN diodes, bipolar junction transistors, field effect devices; negative and positive feedback circuits; oscillators, operational amplifiers, active filters; basics of digital logic circuits, combinational and sequential circuits, flip-flops, timers, counters, registers, A/D and D/A conversion, Opto-electronic devices, Microprocessor and microcontroller basics.

Section 7: Communication systems

Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI systems.

Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers.

Information theory: entropy, mutual information and channel capacity theorem.

Digital communications: PCM, DPCM, digital modulation schemes (ASK, PSK, FSK, QAM), bandwidth, inter-symbol interference, MAP, ML detection, matched filter receiver, SNR and BER.

Section 8: Electromagnetics

Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector.

Plane waves and properties: reflection and refraction, polarization, Phase and group velocity, propagation through various media, skin depth.

Transmission lines, Rectangular and circular waveguides, light propagation in optical fibers, dipole and monopole antennas, linear antenna arrays.

3. Department of Applied Mathematics

DISCIPLINE : MATHEMATICS

Differential & Integral calculus
Vector calculus
Algebra (Linear & Abstract)
Differential equations (ODE & PDE)
Laplace & Fourier transforms, Fourier series.
Probability, statistics & operations research
Numerical methods
Special functions
Real and complex analysis

DISCIPLINE : MATHEMATICS AND COMPUTING:

Entrance exam will be 30% in Mathematics domain and 70% in Computing Domain

Mathematics Doman (30%)

Calculus: Sequences and Series, differential calculus, integral calculus, vector calculus. Basics and ordinary differential equation (ODE) and partial differential equation (PDE), Fourier Series.

Linear Algebra: Determinants and matrices, Cayley-Hamilton Theorem, Hermitian, skew Hermitian, unitary matrices, eigen values, eigen vectors.

Transforms: Laplace Transform, Fourier Transform.

Numerical Analysis: Numerical solution of algebraic equations using Gauss elimination and Gauss-Siedel methods, Gauss Jordan, numerical solution of ordinary differential equations using Picard, Euler method. Interpolation.

Probability and Statistics: mean, mode, median and standard deviation, Probability space, conditional probability, Baye's theorem, uniform, binomial, poisson, normal and exponential distribution.

Computing Domain (70%)

Programming: Programming fundamentals & C/C++ programming, object-oriented programming concepts using C++/JAVA.

Data Structures and Algorithms: Arrays, stack, queue, linked list, trees, binary search trees, graph, sorting and searching. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Asymptotic space and time complexity.

Digital Logic Design: Boolean Algebra, Logic Functions, combinational and sequential circuit design, registers and counters, logic families.

Computer organization and architecture: Machine instructions and addressing modes, Instruction pipelining, memory hierarchy, I/O devices.

Computer network: OSI, TCP/IP, Brief overview of OSI layers, IPv4, IPv6, routers and routing algorithms (distance vector, link state), congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP).

Database Management System: ER model, relational model, normalization, integrity constraints, SQL, indexing transaction

processing, concurrency control.

Theory of Computation: Regular expression, Finite automata, context free grammar, pushdown automata, regular and context free languages, pumping lemma, Turing machine.

Compiler Design: Lexical Analysis, parsing, syntax-directed translation, runtime environments, intermediate code generation.

Operating System: Types of OS, process management, concurrency and synchronization, CPU scheduling, deadlocks, memory management and virtual memory, disk scheduling, file systems.

Discrete Structures: Classical logic theory, Boolean algebra and relations and graph, tree, spanning tree, planar graph and coloring.

Software Engineering: Requirement and Feasibility Analysis, Data flow Diagrams, Process life cycle, design, coding, testing, implementation and maintenance.

4. Department of Civil Engineering

DISCIPLINE : CIVIL ENGINEERING

Section - 1 : Civil Engineering (General)

Engineering Surveying, Basic principles of surveying, types and classification of survey, surveying equipment, levelling, Maps and Map making, Indian Map series. Engineering Mechanics, Basic terminology, Units and dimensions, Force, Torque, Friction, Laws of mechanics Free body diagram, solid mechanics. Construction Materials, Types and characteristics of different types of construction materials to include Steel, Concrete, Wood, Stone, Brick/Masonry etc, requirements of good construction materials. Transportation and Highway Engineering – Types and classification of roads, IRC, road construction and materials, road construction equipment. Project Management, Basic terms in project management, , CPM/PERT, critical path, float/slack, quality control, risk management, resource scheduling and management, project management software.

Section - 2 : Mathematics

Linear Algebra - Vector calculus; matrices; similarity transformations, diagonalization, Cayley-Hamilton Theorem, Hermitian, skew Hermitian, unitary matrices, eigenvalues and eigenvectors; linear differential equations: second order linear differential

equations; Partial differential equations, Laplace transform, Fourier series & analysis; Tensors. Numerical Analysis – Numerical Analysis - Numerical solution of algebraic equations using Gauss elimination and Gauss-Siedel methods, numerical solution of ordinary differential equations using Picard, Euler method. Interpolation. Statistics and Probability - mean, mode, median and standard deviation, Probability space, conditional probability, Baye's theorem, various types of distributions, uniform, binomial, poisson, normal and exponential distribution.

Section - 3 : Hydraulics and Water Resource Engineering

Fluid Mechanics: Properties of fluids, fluid statics; Continuity, momentum, and energy equations and their applications; Potential flow, Laminar, and turbulent flow; Flow in pipes, pipe networks; Concept of boundary layer and its growth; Concept of lift and drag. Open Channel Flow and Hydraulic Machines: Introduction of open channel flow, energy depth relationship, uniform flow, gradually varied flow, water surface profiles, and its computations, rapidly varied flow and its computations, spatially varied flow, unsteady flows, hydraulics of mobile bed channels, Fluid machinery; Turbines, pumps and hydro-electric power systems. Water Resources Engineering: Hydrologic cycle and its components, hydrograph analysis, flood estimation, and routing, surface runoff models, hydrological modelling, groundwater hydrology - steady state well hydraulics and aquifers; Application of Darcy's Law, Crop water requirements - Duty, delta, Diversion headworks, canal falls, Regulators modules, Design and construction of gravity dams, Theories of seepage and design of weirs, barrages and dams, spillways, energy dissipators.

Section - 4 : Structural Engineering

Mechanics of Material: Bending moment and shear force in statically determinate beams; Simple stress and strain relationships; Theories of failures; Simple bending theory, flexural and shear stresses, shear centre; Uniform torsion, buckling of column, combined and direct bending stresses. Structural Analysis: Statically determinate and indeterminate structures by force/ energy methods; Method of superposition; Analysis of trusses, arches, beams, cables and frames; Displacement methods: Slope deflection and moment distribution methods; Influence lines; Stiffness and flexibility methods of structural

analysis. Concrete Structures: Working stress, Limit state and ultimate load design concepts; Design of beams, slabs, columns, footing, staircase; Pre-stressed concrete.

Steel Structures: Working stress and Limit state design concepts; Design of tension and compression members, beams and beam-columns, column bases; Connections – simple and eccentric, beam-column connections, plate girders and trusses; Plastic analysis of beams and frames. Prestressed Concrete: Pre-stressing systems and end anchorages, losses of pre-stress. Analysis and design of members for flexure, shear, bond and bearings, Cable layouts, Design of Pre-stressed Bridges. Structural Dynamics: Free and Forced vibration analysis of Single and Multi degree of freedom systems. Orthogonality relationships of principal modes, Earthquake forces, nature and magnitude, pseudo-static method of approximate evaluation of earthquake forces, seismicity, Earthquake Motion and Response, Response Spectra, Philosophy of Capacity Design. Concepts of seismic design: Earthquake resistant design, construction & detailing for RCC and Masonry structures and relevant codes such as IS 1893:2002, IS 13920, IS:4326 etc.

Section - 5 : Geotechnical Engineering

Soil Mechanics and Geotechnical Engineering - Nature of soil, soil formation and soil type, soil properties, basic definitions, phase relations, index properties, basic concepts of clay minerals and soil structure, soil classification and identification, hydraulic conductivity, seepage, compaction, stress distribution, shear strength, Mohr's circle of stress, Mohr-Coulomb failure theory, shear strength parameters, compressibility and consolidation, soil exploration, shallow foundations, settlements of footings and rafts, pile foundations. Geotechnical Earthquake Engineering - Engineering seismology, seismic risks and hazards, social and economic consequences, nature and attenuation of earthquake magnitude, ground motion, site characteristics, dynamic behavior of soils, liquefaction and cyclic mobility, seismic response of soil structure system, mitigation techniques. Rock Mechanics - Problems of rock mechanics, rock exploration, Griffith's theory, Coulomb's theory, in-situ tests on rock mass, mechanical, thermal and electrical properties of rock mass, pressure tunnels, lined and unlined tunnels, foundation on rocks, slope stability, rock bolt anchors and grouting, problems associated with tunnels,

tunnelling in various subsoil conditions and rocks. Uncertainties, Risk and Reliability in Geotechnical Engineering - Risk, randomness, uncertainty, measures of reliability, modeling of uncertainty, probability, tests of goodness-of-fit (chi-square test, Kolmogorov-Smirnov test), reliability methods, deterministic and probabilistic approaches, Monte Carlo simulation and applications, risk assessment. Ground Improvement Techniques - Mechanical modification, precompression, sand drains, soil stabilisation, chemical modifications and grouting, hydraulic modification, ground modification by soil reinforcement, difficult soils.

DISCIPLINE: GEOINFORMATICS

Section – 1: General Engineering

Geology, Origin, composition and internal structure of the earth, Geological time, relative dating and radiometric dating, Plate Tectonics. Rocks, minerals and soils. Optics - Interference, diffraction, polarization, Guided wave Optics, Ray analysis, Modes of planar waveguide, Mode theory for optical fibers, Propagation characteristics, Signal degradation due to dispersion and attenuation, Optical Sources and detectors for communication. Quantum Mechanics - Wave-particle duality, uncertainty principle; Schrodinger equation; linear vectors and operators in Hilbert space; Atomic and Molecular Physics - Quantum states of an electron in an atom; Spectra of one-and many-electron atoms; spin-orbit interaction: fine and hyperfine structures; Zeeman and Stark effects; Electronic, rotational and vibrational spectra of diatomic molecules; selection rules; electronic transitions in diatomic molecules, Franck-Condon principle; Raman effect; EPR, NMR, ESR, X-ray spectra; lasers: Einstein coefficients, population inversion, two, three and four level systems. Information theory: entropy, mutual information and channel capacity theorem. Geoinformatics Applications – in History, Archaeology, Business and management

Section – 2 : Mathematics

Linear Algebra - Vector calculus; matrices; similarity transformations, diagonalization, Cayley-Hamilton Theorem, Hermitian, skew Hermitian, unitary matrices, eigenvalues and eigenvectors; linear differential equations: second order linear differential equations; Partial differential equations, Laplace transform, Fourier series & analysis; Tensors. Numerical Analysis – Numerical Analysis - Numerical solution of algebraic equations using Gauss elimination and Gauss-Siedel

methods, numerical solution of ordinary differential equations using Picard, Euler method. Interpolation. Statistics and Probability - mean, mode, median and standard deviation, Probability space, conditional probability, Baye's theorem, various types of distributions, uniform, binomial, poisson, normal and exponential distribution. Transforms: Laplace Transform, Fourier Transform.

Section - 3 : Geoinformatics, Remote Sensing and GIS

Advance Surveying/GPS/GNSS - Total Stations, GPS/DGPS, Drone, LIDAR Survey, Principles and Components of GPS. Data collection methods, DGPS, Coordinates, datums and map projections Errors in observations and corrections. Aerial Photogrammetry- Types of photographs, Flying height and scale, Relief (height) displacement, Stereoscopy, 3-D Model, Height determination, Digital Elevation Model (DEM), Slope. Photogrammetry and Remote Sensing- Relief (height) displacement, Stereoscopy, 3-D Model, Height and Slope determination, DEM/DSM, Electromagnetic spectrum, Spectral signature, Spectral math and indices Resolutions, Platforms and Sensors, Remote Sensing Data Products, Multispectral, hyperspectral, Microwave, Thermal, Hyperspectral, Introduction to visual and digital image interpretation techniques. GIS and Web GIS- Introduction, Creation of database (spatial and non-spatial), Vector and Raster data, Spatial analysis- Buffer, Overlay, Applications in infrastructure planning, 3D visualization, Disaster mapping, Land-use change. Digital Image Processing, - Image acquisition, Image enhancement techniques, Image restoration, color image processing, multi resolution processing, compression, morphological processing, segmentation, parametric and non-parametric methods of classification, soft classification, wavelets, SVM, ANN, CNN, Deep learning/Machine learning, image processing software. Applications – Geoinformatics/Remote Sensing/GIS applications in Geology, Geotechnical Engineering, Landslides, Disaster Management, Water and Hydraulics Engg, glacial studies, Urban planning, heat island effects, Agriculture, Target detection, Chandrayan/Mars missions etc. Advanced Concepts – Multi-sensor, multi-resolution fusion, Big geospatial data analysis, etc

Section - 4: Civil Engineering

Engineering Surveying, Basic principles of surveying, types and classification of survey, surveying equipment, levelling, Maps and

Map making, Indian Map series. Construction Materials, Types and characteristics of different types of construction materials to include Steel, Concrete, Wood, Stone, Brick/Masonry etc, requirements of good construction materials. Transportation and Highway Engineering – Types and classification of roads, IRC, road construction and materials, road construction equipment. Project Management, Basic terms in project management, , CPM/PERT, critical path, float/slack, quality control, risk management, resource scheduling and management, project management software Fluid Mechanics: Properties of fluids, fluid statics; Continuity, momentum, and energy equations and their applications; Open Channel Flow: Introduction of open channel flow, energy depth relationship, uniform flow, gradually varied flow, water surface profiles, and its computations, spatially varied flow, unsteady flows, hydraulics of mobile bed channels, Water Resources Engineering: Hydrologic cycle and its components, hydrograph analysis, flood estimation, and routing, surface runoff models, hydrological modelling, groundwater hydrology - steady state well hydraulics and aquifers; Application of Darcy's Law, Crop water requirements - Duty, delta, Diversion headworks, canal falls, Regulators modules, Design and construction of gravity dams, Theories of seepage and design of weirs, barrages and dams, spillways, energy dissipaters. Soil Mechanics and Geotechnical Engineering - Nature of soil, soil formation and soil type, soil properties, basic definitions, phase relations, index properties, basic concepts of clay minerals and soil structure, soil classification and identification. Geotechnical Earthquake Engineering - Engineering seismology, seismic risks and hazards, social and economic consequences, nature and attenuation of earthquake magnitude, ground motion, site characteristics, dynamic behavior of soils, liquefaction and cyclic mobility, seismic response of soil structure system, mitigation techniques. Rock Mechanics - Problems of rock mechanics, rock exploration, in-situ tests on rock mass, mechanical, thermal and electrical properties of rock mass.

Section - 5 : CSE, IT, ECE

Electromagnetics - Maxwell's equations: differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector Plane waves and properties: reflection and refraction, polarization, Phase and group velocity, propagation through various media, skin

depth Transmission lines, Rectangular and circular waveguides, light propagation in optical fibers, dipole and monopole antennas, linear antenna arrays. Signals and Image Processing Image transforms- Short term Fourier transform, Wavelet transform, DWT. Image Enhancement techniques- Spatial domain relationship between pixels- basic grey level transformations, Histogram processing, smoothing spatial filters, sharpening spatial filters. Frequency domain-smoothing frequency domain filters-sharpening frequency domain filters, homographic filtering. Segmentation techniques- Thresholding based, cluster analysis, region growing. Morphological Operation-Dilation, Erosion. Histogram and Histogram equalization. Feature Extraction Techniques. Image restoration-Weiner filter, Image reconstruction- radon transform and inverse radon transform. Programming: Programming fundamentals & C/C++ programming, object-oriented programming concepts using C++/ JAVA. Data Structures and Algorithms: Arrays, stack, queue, linked list, trees, binary search trees, graph, sorting and searching. Algorithm design techniques: greedy, dynamic programming and divide-and-conquer. Asymptotic space and time complexity. Digital Logic Design, Discrete Structures, Computer organization and architecture: Boolean Algebra, Logic Functions, registers and counters, logic families, Machine instructions and addressing modes, Instruction pipelining, memory hierarchy, I/O devices. Database Management System: ER model, relational model, normalization, integrity constraints, SQL, indexing transaction processing, concurrency control. Web technologies: Web IR retrieval ,Web mining , Bigdata, NOSQL, Basics of cloud (SaaS, PaaS, IaaS, Public and Private Cloud) Artificial intelligence. Artificial intelligence approach for problem-solving, Automated reasoning for propositional logic, statespace representation of problems, bounding functions, breadth-first search, depth-first search etc. Basics of ANN, Supervised, Unsupervised and Reinforcement Learning

5. Department of Computer Science and Engineering/ Department of Information Technology / Department of Software Engineering

Computing related mathematics: Propositional and first-order logic, sets, relations, functions, partial order and

lattice groups. Groups. Vectors, matrices, determinants, System of linear equations, eigenvalues and eigenvectors, LU decomposition. Vector space, differential equation gradients, maxima minima random variables. Uniform Gaussian exponential, Poisson and binomial distributions. Mean Median Mode and standard deviation. Conditional Probability and Bayes Theorem.

Programming and Data structures: Programming in C, recursion, arrays, stacks, queues, linked list, trees, binary heaps, graphs.

Algorithms: Searching sorting hashing asymptotic worst-case time and space complexity algorithm design techniques: Greedy, dynamic programming and divide and conquer. Graph search, minimum spanning trees, shortest path.

Theory of computation: Regular expression and finite automata context-free grammar and pushdown automata, regular and context-free languages, pumping Lemma, Turing machines and undecidability.

Compiler Design: Lexical analysis parsing syntax-directed translation runtime environments intermediate code generation

Operating system: Processes inter-process communication concurrency and synchronisation, deadlock CPU scheduling, memory management and virtual memory file systems.

Database management systems: ER model, relational algebra, tuple calculus, SQL integrity constraints, normal forms, file organisation, indexing (B and B plus trees) transactions and concurrency control.

Computer networks: Concept of layering. LAN Technologies (Ethernet) flow and error control techniques, switching ipv4/ ipv5 routers and routing algorithms (distance vector, link state). TCP/UDP and socket congestion control, Application layer protocols (DNS, SMTP POP3 HTTP), Basics of Wi-Fi, network security: Authentication, basics of Public key and Private key cryptography digital signatures and certificates, firewalls.

CIDR notation, Basics of IP support protocols (ARP, DHCP, ICMP), Network Address Translation (NAT), and Email.

Software engineering: Software development life cycle, requirement and feasibility analysis, data flow diagrams, process specifications, input/ output planning and managing the project, design, coding, software testing, implementation, maintenance, software metrics.

Web technologies: Web IR retrieval ,Web mining , Bigdata, NOSQL, Basics of cloud (SaaS, PaaS, IaaS, Public and Private Cloud).

Artificial intelligence: Artificial intelligence approach for problem-solving, Automated reasoning for propositional logic, state-space representation of problems, bounding functions, breadth-first search, depth-first search, A, A*, A^o, etc. Frames scripts semantic nets, production system, procedural representation.

Basics of Artificial Neural Networks (ANN): Supervised, Unsupervised and Reinforcement Learning.

6. Department of Delhi School of Management

Managerial themes such as E-Governance, Information Technology Management, Strategic Management, Marketing Management, Distribution and Retail Management, Organizational Behavior, Human Resources Management, Corporate Governance and Ethics, Public Policy and Governance, Accounting and Finance, Portfolio Management, Mergers and Acquisition, Corporate Restructuring, Knowledge Management, General Management Principle and Practices, Supply Chain Management, Business Research Methods, Business Statistics.

7. Department of Design

1. Visualization and Spatial ability
2. Environmental and Social Awareness
3. Analytical and Logical Reasoning
4. Language and Creativity
5. Observation and Design Sensitivity

8. Department of Electrical Engineering

Section 1 : Electric Circuits

Network graph, KCL, KVL, Node and Mesh analysis, Transient response of dc and ac networks, sinusoidal steady-state analysis, resonance, passive filters, Ideal current and voltage sources, Thevenin's theorem, Norton's theorem, Superposition theorem, Maximum power transfer theorem, Two-port networks, Three phase circuits, Power and power factor in ac circuits.

Section 2 : Electromagnetic Fields

Coulomb's Law, Electric Field Intensity, Electric Flux Density, Gauss's Law, Divergence,

Electric field and potential due to point, line plane and spherical charge distributions, Effect of dielectric medium, Capacitance of simple configurations, Biot-Savart's law, Ampere's law, Curl, Faraday's law, Lorentz force, Inductance, Magneto motive force, Reluctance, Magnetic circuits, Self and Mutual inductance of simple configurations.

Section 3 : 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, Applications of Fourier Transform, Laplace Transform and z-Transform.

Section 4 : Electrical Machines

Single phase transformer; equivalent circuit, phasor diagram, open circuit and short circuit tests, regulation and efficiency; Three phase transformer; connections, parallel operation; Auto-transformer, Electron mechanical energy conversion principles, DC machines; separately excited, series and shunt, motoring and generating mode of operation and their characteristics, starting and speed control of dc motors; Three phase induction motors, Principle of operation, types, performance, torque-speed characteristics, no-load and blocked rotor tests, equivalent circuit, starting and speed control; Operating principle of single phase induction motors; Synchronous machines: cylindrical and salient pole machines, performance, regulation and parallel operation of generators, starting of synchronous motor, characteristics; Types of losses and efficiency calculations of electric machines.

Section 5 : Power systems

Power generation concepts, ac and dc transmission concepts, Models and performance of transmission lines and cables, Series and shunt compensation, Electric field distribution and insulators, Distribution systems, Per-unit quantities, Bus admittance matrix, Gauss-Seidel and Newton-Raphson load flow methods, Voltage and Frequency control, power factor correction, Symmetrical components, Symmetrical and unsymmetrical fault analysis, Principles of over-current, differential and distance protection; Circuit breakers, System stability concepts, Equal area criterion.

Section 6 : Control Systems

Mathematical modeling and representation of systems, Feedback principle, transfer

function, Block diagrams and Signals flow graphs, Transient and Steady-state analysis of linear time invariant systems, Routh-Hurwitz and Nyquist criteria, Bode plots Root loci, Stability analysis, Lag, Lead and Lead-Lag compensators; P, PL and PID controllers; State space model, State transition matrix.

Section 7 : Electrical and Electronic Measurements

Bridges and potentiometers, Measurement of voltage, current, power, energy and power factor; Instrument transformers, Digital voltmeters and multimeters, Phase, Time and Frequency measurement; Oscilloscopes, Error analysis.

Section 8 : Analog and Digital Electronics

Characteristics of diodes, BJT, MOSFET; simple diode circuits clipping, clamping, rectifiers; Amplifiers; Biasing, Equivalent circuit and Frequency response; Operational amplifiers; Characteristics and applications, Combinational and Sequential logic circuits, multiplexer, DE multiplexer, 8085 microprocessors; Architecture, programming and Interfacing.

Section 9 : Power Electronics

Characteristics of semiconductor power devices; Diode, Thyristor, Triac, GTO, MOSFET, IGBT; DC to DC conversion; Buck, Boost and Buck-Boost converters; Single and three phase configuration of uncontrolled rectifiers, Line commutated thyristor based converters, Bidirectional ac to dc voltage source converters, Issues of line current harmonics, Power factor, Distortion factor of ac to dc converters, Single phase and three phase inverters, Sinusoidal pulse width modulation.

9. Department of Electronics and Communication Engineering

Engineering Mathematics:

Calculus: Sequences and Series, differential calculus, integral calculus, vector calculus. Basics and ordinary differential equation (ODE) and partial differential equation (PDE), Fourier Series Linear Algebra: Determinants and matrices, Cayley-Hamilton Theorem, Hermitian, skew Hermitian, unitary matrices, eigen values, eigen vectors. Vector space, basis, linear dependence and independence, Numerical Analysis: Numerical solution of algebraic equations using Gauss elimination and Gauss-Siedel methods, Gauss Jordan,

numerical solution of ordinary differential equations using Picard, Euler method. Interpolation. Probability and Statistics: mean, mode, median and standard deviation, Probability space, conditional probability, Baye's theorem, uniform, binomial, poisson, normal and exponential distribution.

Networks, Signals and Systems

Network solution methods; nodal and mesh analysis; Network theorems; superposition, Thevenin and Norton's, maximum power transfer; Wye-Delta transformation; Steady state sinusoidal analysis using phasors; Time domain analysis of simple linear circuits; Solution of network equations using Laplace transform; Frequency domain analysis of RLC circuits; Linear 2-port network parameters; driving point and transfer functions; State equations for networks. Continuous-time signals; Fourier series and Fourier transform representations, sampling theorem and applications; Discrete-time signals; discrete-time Fourier transform (DTFT), DFT, FFT, Z-transform, interpolation of discrete-time signals; LTI systems; definition and properties causality, stability, impulse response, convolution, poles and zeros, parallel and cascade structure, frequency response, group delay, phase delay, digital filter design techniques.

Signals and Image Processing

Image transforms- Short term Fourier transform, Wavelet transform, DWT. Image Enhancement techniques- Spatial domain-relationship between pixels- basic grey level transformations, Histogram processing, smoothing spatial filters, sharpening spatial filters.

Frequency domain- smoothing frequency domain filters-sharpening frequency domain filters, homographic filtering.

Segmentation techniques- Thresholding based, cluster analysis, region growing.

Morphological Operation- Dilation, Erosion. Histogram and Histogram equalization. Feature Extraction Techniques. Image restoration-Weiner filter, Image reconstruction-radon transform and inverse radon transform.

Electronic Devices

Energy bands in intrinsic and extrinsic silicon; Carrier transport; diffusion current, drift current, mobility and resistivity; Generation and recombination of carriers; Poisson and continuity equations; P-N junction, Zener diode, BJT, MOS capacitor, MOSFET, LED,

photo diode and solar cell; Integrated circuit fabrication process; oxidation, diffusion, ion implantation, photolithography and twin-tub CMOS process.

Analog electronics

Small signal equivalent circuits of diodes, BJTs and MOSFETs; Simple diode circuits; clipping, clamping and rectifiers; Single-stage BJT and MOSFET amplifiers; biasing, bias stability, mid frequency small signal analysis and frequency response; BJT and MOSFET amplifiers; multi-stage, differential, feedback, power and operational; Simple op-amp circuits; Active filters; Sinusoidal oscillators; criterion for oscillation, single-transistor and op-amp configurations; Function generators, wave-shaping circuits and 555 timers; Voltage reference circuits; Power supplies; ripple removal and regulation.

Digital Circuits:

Number systems; Combinatorial circuits; Boolean algebra, minimization of functions using Boolean identities and Karnaugh map, logic gates and their static CMOS implementations, arithmetic circuits, code converters, multiplexes, decoders, encoders, PALs and PLAs; Sequential circuits; latches and flip-flops, counters, shift-registers and finite state machines; Data converters; sample and hold circuits, ADCs and DACs; Semiconductor memories; ROM, SRAM, DRAM; 8-bit microprocessor (8085); architecture, programming, memory and I/O interfacing.

Control Systems

Basic control system components; Feedback principle; Transfer function; Block diagram representation; Signal flow graph; Transient and steady-state analysis of LTI systems; Frequency response; Routh-Hurwitz and Nyquist stability criteria; Bode and root-locus plots; Lag, lead and lag-lead compensation; State variable model and solution of state equation of LTI systems.

Communications

Random processes: autocorrelation and power spectral density, properties of white noise, filtering of random signals through LTI system; Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers, circuits for analog communication; Information theory: entropy, mutual information and channel capacity theorem; Digital communications: PCM, DPCM, digital modulation schemes,

amplitude, phase and frequency shift keying (ASK, PSK, FSK), QAM, MAP and ML decoding, matched filter receiver, calculation of bandwidth, SNR and BER for digital modulation; Fundamentals of error detection and correction, Single parity code, Hamming codes; Timing and frequency synchronization, inter-symbol interference and its mitigation; Basics of TDMA, FDMA and CDMA.

Electromagnetics:

Electromagnetics; Maxwell's equations:

differential and integral forms and their interpretation, boundary conditions, wave equation, Poynting vector; Plane waves and properties: reflection and refraction, polarization, phase and group velocity, propagation through various media, skin depth; Transmission lines: equations, characteristic impedance, impedance matching, impedance transformation, S-parameters, Smith chart; Waveguides: modes, boundary conditions, cut-off frequencies, dispersion relations; Antennas: antenna types, radiation pattern, gain and directivity, return loss, antenna arrays; Basics of radar; Light propagation in optical fibers, Modal Analysis of a step index fiber, Attenuation and dispersion in optical fibers, Optical sources and detectors, Optical Amplifiers, Optical link design.

10. Department of Environmental Engineering

Characteristics of water and waste water, Water quality requirements, water & waste water treatment, Air quality, Air Pollution & control, Solid waste, Solid Waste management, Engineering system for resource and energy recovery, Industrial waste management, Environmental impact assessment.

11. Department of Humanities

The Following Syllabus is common for :

DISCIPLINE : Humanities (Economics)

DISCIPLINE : USME (Economics)

Micro Economics

Consumer behaviour, Demand and Supply analysis, Concept of Elasticity. Theory of production and costs, Forms of Market, Pricing and Output Decision. Tax and Subsidy, Elements of General Equilibrium and Welfare Economics.

Macro Economics

Determination of output and Employment, National Income- Concept and Determinants:

Concept of money, bank, Inflation- Causes and Remedies, Concept of multiplier, Business Cycle, IS and LM function. Concept of Growth and Development: Various models of Growth.

International Trade

Theories of International Trade, Balance of Payment, Terms of Trade, Free trade and Protection.

Indian Economy

Main features: Geographic Size, Natural Resources, Population, Poverty, Agriculture, Industry, Unemployment, Public finance, Meaning and Measurement of Growth Development-meaning and Characteristics of Underdevelopment.

Statistics

Measures of Central tendency, Measurement of Dispersion, Correlation, Regression, Interpolation and Extrapolation Sampling Distributions Normal, t, Chi square, F distribution, Testing of hypothesis, Index numbers.

12. Department of Mechanical Engineering

Section 1: Applied Mechanics and Design

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.

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.

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.

Vibrations: Free and forced vibration of single degree of freedom systems, effect of damping;

vibration isolation; resonance; critical speeds of shafts.

Machine Design: Design for static and dynamic loading; failure theories; fatigue strength and the SN 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.

Section 2: Fluid Mechanics and Thermal Sciences

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.

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

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.

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.

Section 3: Materials and Manufacturing

Engineering Materials: Structure and properties of engineering materials, phase diagrams, heat treatment, stress-strain diagrams for engineering materials.

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.

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.

Section 4: Industrial Engineering

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).

Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools; additive manufacturing. Robotics and Mechatronics.

Production Planning and Control: Forecasting models, aggregate production planning, scheduling, materials requirement planning; lean manufacturing.

Inventory Control: Deterministic models; safety stock inventory control systems.

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

13. USME

Discipline: Management

Managerial themes such as Management Principles, Information Technology Management, Business policy and Strategic

Management, Marketing Management, Distribution and Retail Management, Brand and product management, Organizational Behavior and Development, Human Resources Management, Performance and talent management, Corporate Governance and Ethics, Public Policy and Governance, Accounting and Finance, Portfolio Management, Mergers and Acquisition, Corporate Restructuring, Knowledge Management and Practices, Supply Chain Management, Business Research Methods, Business Statistics.

Operations management, vendor management, Services marketing and service operations, CRM, Business Analytics, predictive techniques, marketing financial and HR analytics, supply chain analytics, optimization techniques, big data analytics. Entrepreneurship, innovation management, managing technology. Managerial Economics, forecasting, inventory management, various types of costing approaches, total quality management.

Discipline: Innovation Entrepreneurship and Venture Development

Unit 1: Comprehension Passages from success stories in Entrepreneurship and startup Leadership. Current affairs related to start-ups.

Unit 2: Entrepreneurship, Social entrepreneurship, Intrapreneurship, Entrepreneurial Characteristics, Entrepreneur v/s Manager, Entrepreneurial Motivation.

Unit 3: Innovation Management, Diffusion of Innovation, Innovation Cycle, New Product Development, Design Thinking.

Unit 4: Startup, Stages of Startup, Ideation, Pre-startup, Startup and Scaling up Stage, Start Up India Program, Start Up concept and its support to start Ups, Startup Financing, Seed Funding, Angel investors, venture capital funding, government financial support for startups, MSME-definition and its types.

Unit 5: Government Schemes & Policy for Startups and MSMEs, ATAL Innovation Mission (AIM), ATAL Tinkering Lab (ATL), Self Employment & Talent Utilization (SETU) scheme, SFURTI Scheme, Intellectual Property Rights (IPR), Start Up Intellectual Property Protection (SIPP), Trademark, Copyright, Patents, Type of Companies in India and their Characteristics, Formation Legalities of the Company.

**Dean (Acad-PG)/ Associate Dean (Acad-PG)/
Ph. D Admission Coordinator**

DELHI TECHNOLOGICAL UNIVERSITY

Shahbad Daultapur, Bawana Road, Delhi-110042

Website: **www.dtu.ac.in**

Helpdesk Email ID: **phdcoordinator@dtu.ac.in**



DELHI TECHNOLOGICAL UNIVERSITY

(Formerly Delhi College of Engineering)

Shahbad Daultapur, Bawana Road, Delhi-110042