ADMISSION BROCHURE FOR ACADEMIC SESSION 2019-20

(Ph.D. /M.Phil. PROGRAMME)

Guru Gobind Singh Indraprastha University
Sector 16C, Dwarka, Delhi - 110078

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ADMISSION TO Ph.D./M.Phil. PROGRAMME (2019-20)

Applications are invited for admission to Ph.D. Programme in the following disciplines:

Information Technology, Computer Science & Engineering, Computer Applications, Electronics & Communication Engineering, Mechanical & Automation Engineering, Management, Chemical Technology, Bio-Technology, Environmental Sciences, Medical Sciences, Physiotherapy, Mathematics, Chemistry, Physics, English, Sociology, Law & Legal Studies, Mass Communication and Education and M.Phil. programme in English, Clinical Psychology and Psychiatric Social Work as per Ph.D. Ordinance 2017 available at link: http://www.ipu.ac.in/norms/phdbom210717.pdf.

1. Common minimum eligibility criteria for admission to Ph.D. Programmes:

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

1.2. A relaxation of 5% of marks, from 55% to 50%, or an equivalent relaxation of grade, shall be allowed for those belonging to SC/ST/Differently-Abled (PWD) categories.

1.3. A person, whose M.Phil. dissertation has been evaluated and the viva voce is pending may be admitted to the Ph.D. programme.

1.4. Candidates possessing a M.Phil. degree or a degree considered equivalent to M.Phil. Degree of an Indian Institution.

1.5. A degree considered equivalent to M.Phil. Degree of an Indian Institution, from a Foreign Educational Institution accredited by an Assessment and Accreditation Agency which is approved, recognized or authorized by an authority, established or incorporated under a law in its home country or any other statutory authority in that country for the purpose of assessing, accrediting or assuring quality and standards of educational institutions, shall be eligible for admission to Ph.D. programme.

* For details regarding school specific eligibility criteria, candidates may refer to school wise details.

* The eligibility criteria and procedure for admission as specified in this admission brochure are subject to "changes made in the ordinances, rules and regulations by the University from time to time as per the decision of University and/or statutory bodies governing various programmes".

2. Common minimum eligibility criteria for admission to M.Phil. Programmes:

(i) M.Phil. (English) at University School of Humanities & Social Sciences

(ii) M.Phil. (Clinical Psychology) at PGIMER & Dr. RML Hospital

(iii) M.Phil. (Psychiatric Social Work) at PGIMER & Dr. RML Hospital

(i) M.Phil. (English) :

1. 50% of seats are reserved for students of M.A.(English and Communication) of the University School of Humanities and Social Sciences of the University. The admission to these seats shall be on the basis of the merit list prepared on the basis of the applicants cumulative performance index (CPI) obtained in the qualifying degree. Only candidates who obtain their qualifying degree in 2017 are eligible for consideration of their candidature. The candidates satisfying this condition may not appear in CET conducted by the University. This group of applicants shall keep the copy of the admit card for proof of candidature at the time of admission.

2. 50% of seats are reserved for any candidate with M.A.(English) or equivalent degree from any UGC recognized University. These candidates shall have to appear in the CET conducted by the University.

3. Seats of any of the above groups are interconvertable, if remaining vacant.

(ii) M.Phil. (Clinical Psychology) :

1. M.A./M.Sc. degree in Psychology or equivalent from a University recognized by the UGC with a minimum of 55% marks in aggregate preferably with special paper in Clinical Psychology.

2. The CET shall be followed by an interview, of the qualified candidates of the CET, for admission to this programme. Weightage of marks will be 90% for CET and 10% for the interview and practical, as per RCI.

3. The candidates shall be called in the ratio of 1 seat: 3 candidates for the purpose of the interview (category-wise).

4. Schedule and venue of Interview and Practical to be notified later by the Dean, University School Medical, Paramedical and Health Sciences.

5. Admissions Criteria: Applicants must appear in the CET conducted and the interview/practical. Absence in any part of the CET, practical, interview shall make the candidate ineligible for admissions. The admissions would be based on the merit / rank in the CET (all components) and the eligibility conditions.

Note: - Candidates with M.A. /M.Sc. degree by correspondence, part time course or by distance education are not eligible for admission.

(iii) M.Phil. (Psychiatric Social Work) :

1. Minimum educational requirement for admission to this course will be M.A. degree in Social Work from a University recognized by the UGC with a minimum of 55% marks in aggregate. For SC/ST category, minimum of 50% marks in aggregate is essential, as per GOI. Candidates with MA degree by correspondence course, part-time course or by distance education are not eligible.

2. The CET shall be followed by an interview, of the qualified candidates of the CET, for admission to this programme. Weightage of marks will be 90% for CET and 10% for the interview and practical, as per RCI.

3. The candidates shall be called in the ratio of 1 seat: 3 candidates for the purpose of the interview (category-wise).

4. Schedule and venue of Interview and Practicals to be notified later by the Dean, University School Medical, Paramedical and Health Sciences.

5. Admissions Criteria: Applicants must appear in the CET conducted and the interview/practical. Absence in any part of the CET, practical, interview shall make the candidate ineligible for admissions. The admissions would be based on the merit / rank in the CET (all components) and the eligibility conditions.

3. Procedure for Admission to Ph.D. Programmes

3.1. Admission to the Ph.D. programme of studies shall be through an Entrance Test (PET) conducted by the University in the relevant disciplines of study.

3.2. For those students who qualify UGC-NET (including JRF) / UGC-CSIR NET (including JRF) ** / GATE* / DBT-JRF / ICMR-JRF / Teacher fellowship holder or have passed M.Phil. programme, such candidates for admission to Ph.D. programme shall be exempt from the entrance test conducted by the University. However, they shall have to apply for admission to the University.

Such candidates need to submit the relevant documents in support of their claim along with a request for exemption latest by 17th May, 2019 at the respective schools. A list of candidates exempted from appearing in PET shall be displayed on University website on 23rd May, 2019.

* Candidates with valid and qualified GATE score.

** Candidates with valid and qualified NET score and with Junior Research Fellowship.

3.3. Reservation shall be as per the State Reservation Policy, notified by the University from time to time.

3.4. The written entrance test shall be qualifying for admission to Ph. D. programme with 50% of total marks as qualifying cut off for general category. For SC/ST/OBC/PWD category the qualifying cut off shall be 45% of total marks. The syllabus of the written entrance test shall consist of 50% of research methodology and 50% shall be subject specific.

3.5. An interview / vice-voce shall be organized where the candidates are required to discuss their research interest / area through a presentation before a duly constituted Admission Committee.

3.6. The admission shall be based on the performance / merit of the candidate in the interview/viva-voce. The interview/viva-voce shall consider the following aspects, viz. whether:

(a) The candidate possesses the basic knowledge and aptitude for the proposed research work;

(b) The candidate possesses the competence for the proposed research work;

(c) The proposed plan of research can contribute to new/additional knowledge in the area of research.

For written entrance test qualified candidates, the merit list (out of 100 marks), for admissions will be prepared as per following criteria:

(i) 50% weightage will be given to the marks obtained in written entrance test;

(ii) 25% weightage will be given on the above three criteria listed in 2.6 (a), (b) & (c);

(iii) 25% weightage will be given to interview/Viva-voce.

For candidates, exempted from written entrance test, the merit list will be prepared on the basis of points listed at Sr. No. 3.6 (ii) & (iii) above, scaled up to 100 marks.

* There shall not be any negative marking in the written examination (PET).

3.7. Employed candidates including permanent faculty members of the University Schools or affiliated colleges/institutions, who wish to seek Ph.D. admission as full-time research scholars, must obtain leave for a period of at least three years to fulfill the minimum registration period of the University. Candidates who need proof of selection to obtain leave from their employers may use the selection/admission list displayed on the

University website for this purpose, but admission shall only be granted upon submission of the leave sanction letter in original. All employed candidates (full-time / part-time), in regular employment must obtain a "No Objection Certificate" for the purpose of pursuing Ph.D. programme, the same must be submitted at the time of interview for admission.

* The University reserves the right to cancel any PET. The University also reserves the right not to fill any or all the available / notified Ph.D slots.

4. Procedure for Admission to M.Phil. Programmes

The admissions to the M.Phil programmes in the Guru Gobind Singh Indraprastha University (GGSIPU) are through common entrance tests (CET) conducted by the University.

The applicants must appear in the appropriate CET for admission. Only CET qualified applicants shall be considered for admission, through the University counselling, subject to fulfilment of eligibility and admission criteria.

The written entrance test shall be qualifying for admission to M.Phil programme with 50% of total marks as qualifying cut off for general category. For SC/ST/OBC/PWD category the qualifying cut off shall be 45% of total marks.

* The University reserves the right to cancel any CET. The University also reserves the right not to fill any or all the available / notified M.Phil. slots.

4.1 Subjects of M.Phil entrance Test:

Sl.No.	CET	CET Code	Subjects
1	M.Phil (Clinical Psychology)	157	M.A./M.Sc. Level in Psychology
2	M.Phil (English)	161	(i) Candidates shall be judged for their knowledge of English literature, language and theory at Master's level. (ii) CET shall be subjective in nature. Question paper would consist of (a) Critical Assessment of a given text. (b) Essay type question covering various aspects of literature
3	M.Phil (Psychiatric Social Work)	199	Sociology for Social Workers ; Dynamics of Personality and Human Behaviour Ecology,; Environment and Social Work ; Social Policy and Social Welfare Administration ; Dynamics of Development ;Contemporary Social Problems ; Criminology and Corrections ; Community Health and Social Work; Population Dynamics and Gender Issues; Clinical Social Work; Social welfare in India Women's Welfare and Development; Child Welfare and Development; Management of development and welfare organizations; Social work for senior citizens and differently abled; Human resource management; Community development; Understanding Society; Introduction to Economics; Development Experience, Social Conflict and Change; Human Development, Identity,

			Culture and Media; Governance and Public Administration, Social Policy, Law and Social Work; History and Ideologies of Social Work; Participatory Communication; Quantitative Research; Quantitative Research; Community Organisation and Development Practice; Family Social Work Community Health; Disasters, Impoverishment and Social Vulnerability; Social Work Research and Statistics; General Psychology; Understanding of Indian Society; Social work with Groups; Social Policy in India; Community Organization; Counseling and communication; Social Development ; Computer Applications in Social Sciences; Management of Social Service Sector; Medical And Psychiatric Information and its relevance to Social work Practice; Rural community development; Tribal community development; Life skills and soft skills; Policies and programsurban and rural ; Individual and society; Human Rights, Social Justice and Social Work; Disaster Management; Management of Non-Profit Organisations; Developmental/ Therapeutic Counselling; Rehabilitative and Correctional Social Work; Persons with Disabilities and Equalisation of Opportunities; Persons with Disabilities and Equalisation of Opportunities; Dalits and Tribals: Social Justice, Equity and Governance Criminology and Justice; Rural Development, Environment and Sustainable Livelihoods; Urban Development: Unorganised Sector and Livelihood; Social Work in the Field of Mental Health; Social Policy and Planning; Juvenile Justice and Youth in Conflict; Social Work Research and Statistics

- ***The M.Phil. CETs will be of 2 ½ hours duration with 100 numbers of MCQ's except in M.Phil (English).*** *Each question shall carry four marks. There will be no negative marking for incorrect answer.* ***In M.Phil (English), 50% marks shall be for MCQ questions and 50% marks will be for subjective questions.***

5. Important Instructions:

1. The term "University", in this admission brochure shall mean the Guru Gobind Singh Indraprastha University.

2. The application forms shall be available in the online mode only from the University Website: http://www.ipu.ac.in.

3. The last date of application may be extended for any programme or programme group for which a common entrance test is to be conducted by the University.

4. It is the responsibility of the candidates to ascertain whether he/she possess the requisite eligibility and qualifications for admission. Applying for a particular PET/CET, appearing for the written examination and qualifying the same does not necessarily mean acceptance of eligibility (as

defined earlier). Every applicant for a particular PET/CET must satisfy the eligibility criterion as specified in this brochure (or its amendments / corrections).

5. The applicants are advised that since the form filling as well as admit cards shall be made available through the online mode only; they must keep the details of their login id and the password secure and safe.

6. Applicants should be careful in choosing the PETs/CETs that they apply for, as no change would be permissible after the application has been submitted.

7. The language of the PET/CET shall be **English**.

8. From the merit of a specific PET/CET Code, admissions are in general made to a specific set of programmes of studies.

9. After the application for any PET/CET is submitted, if there is any mistake in date of birth, spelling mistake in name of applicants or the parents name or in the choice of category/region claimed for the purpose of availing reservation, the applicant must submit an application in physical form (together with applicable processing fees of Rs. 500/-) to:

Reception, Examination Division, Guru Gobind Singh Indraprastha University, Sec 16C, Dwarka, Delh – 110078.

- This application must be submitted within 5 working days of the last date of form submission together with the applicable fees. After this no request for any correction shall be entertained by the Examinations Division.

10. A Separate Application Form has to be filled-in for each programme (s) having distinct PET/CET Code.

11. No separate intimation will be sent to the candidates regarding declaration of results and commencement of counseling/interview/ admission. Result will be declared on University Website (http://www.ipu.ac.in).

Detailed schedule of counseling/interview/admissions will be notified on the University Website (http://www.ipu.ac.in).

12. Applicants should retain a printout of the PET/CET application form as proof of application.

13. In all communications regarding submission of application or otherwise related to admissions, the copy of the application form must be submitted as otherwise the communication would be deemed incomplete and no processing would be performed on the communication, without any notice to the applicant.

14. There will be no rounding-off of the percentage of marks of qualifying examination while deciding the basic eligibility of any candidate for admission e.g. if a candidate obtained 49.99% marks in his/her qualifying examination, then it will not be rounded-off to 50%.

15. For any programme of study, if the University or the statutory regulatory body of the programme of study specifies the medical examination of the candidate, then all admitted students

must present themselves for medical examination. If the student/candidate fails the medical examination, the admission of the candidate/student shall be cancelled by the University.

16. The candidates are advised to check their status with the help of the login id and password.

17. Write the complete e-mail address and phone number in the form carefully. Please note that this email address and phone number may be used by the University for future communication.

18. The nomenclature of degrees to the admitted programmes of studies shall be as per the notification of the University Grants Commission for "Specification of Degrees".

19. The University shall not issue any certificate of equivalence to any other programme of study. That is, if a student is awarded a degree by the University and desires a certificate regarding its equivalence to some other degree, then the request of the student for such equivalence certificate shall be summarily rejected.

20. No admitted student pursuing a programme of study from the Guru Gobind Singh Indraprastha University is allowed to pursue any other (2nd or more) degree / diploma programme of study from any University including GGSIPU. If at any stage it is found that an admitted student has registered for more than one programme of study in GGSIPU or any other University, the admission of such a candidate shall be cancelled from all programmes of studies of GGSIPU.

21. All candidates desirous of seeking admission to any programme of study and/or any institution (including the University Schools of Studies) affiliated to the University, shall be bound by the conditions as laid down in this admission brochure; and the rules and regulations as enshrined in the University Act, Statutes, Ordinances, notifications and guidelines issued from time to time.

22. The medium of instruction for all programmes of studies offered in the University shall be English unless otherwise specified in the Scheme and Syllabi of Examinations of the concerned programme of study.

23. For any programme of study, if the University or the statutory regulatory body of the programme of study specifies the medical examination of the candidate, then all admitted students must present themselves for medical examination. If the student/candidate fails the medical examination, the admission of the candidate/student shall be cancelled by the University.

24. If it is found at any stage during the entire period of the programme that the candidate has furnished any false or incorrect information in the application form or at the time of counselling/admission, his/her candidature for the programme will be cancelled summarily. In addition, disciplinary action may be taken against him/her as per the University rules.

25. If the University is not satisfied with the character, past behaviour or antecedents of a candidate, it can refuse to admit him/her to any course of study of the University.

26. The Vice Chancellor may cancel the admission of any student for specific reasons and debar him/her for a certain period.

27. Only qualifying the PET/CET shall not, ipso facto, entitle a candidate to get admission to a programme.

28. It will also be the sole responsibility of the candidates themselves to make sure that they are eligible and fulfill all the conditions prescribed for admission.

29. The merit of the PET/CET will be valid only for the programme for which the candidate has appeared and cannot be utilized for admission to any other programme. Further, the merit of the PET/CET- 2019 shall be valid only for the academic session 2019-20.

30. RAGGING : Rules in terms of ordinance relating to maintenance of discipline amongst students of the University are as under :

1. Ragging in any form shall be strictly prohibited within the premises of the University, a college or an Institute, as the case may be, or in any part of the University system as well as on public transport, or at any other place, public or private.

2. Any individual or collective act or practice of ragging shall constitute an act of gross indiscipline and shall be dealt with under the provisions of ordinance under reference.

3. Ragging, for the purposes of ordinance under reference, shall ordinarily mean act, conduct or practice by which the dominant power or status of senior students is brought to bear upon the students who are in any way considered junior or inferior by the former and includes individual or collective acts or practices which:

1. Involve physical assault or threat to use physical force.

2. Violate the status, dignity and honour of students, in particular female students and those belonging to a schedule caste or a schedule tribe.

3. Expose students to ridicule or contempt or commit an act which may lower their self-esteem; and

4. Entail verbal abuse, mental or physical torture, aggression, corporal punishment, harassment, trauma, indecent gesture and obscene behaviour.

31. The various terms and conditions mentioned in the Admission Brochure are subject to change made in the ordinances, rules and regulations by the University from time to time as per the decision of University and/or statutory bodies governing various programmes.

32. PET/CET Admit Card: The Admit Card will be available online, on or before 5 days of the date of the PET/CET. The Admit Cards may be downloaded from the candidate's individual account using log-in ID and password from the website which was used for filling up the application form.

33. No candidate will be allowed to enter the Examination Hall without the valid PET/CET Admit Card 2019, issued by the University.

34. Candidates are required to carry two printouts of the admit card at the time of PET/CET. One copy of the admit card must be retained by the candidate after getting it signed by the Invigilator. The second copy should be handed over to the Invigilator for University records. Both the copies

shall require that a passport sized photograph of the candidate is pasted on it. Candidates are advised to keep two copies of the photograph uploaded at the time of form filling handy for this purpose for each PET/CET applied for.

35. Candidate must preserve the PET/CET Admit Card till the admission procedure is over as it has to be handed over to the Admission Officer at the time of counselling/admission.

36. Request for issue of duplicate Admit Card will not be entertained after the Common Entrance Test (under any circumstances).

37. No claim of having filled up the Application Form and non-receipt of admit card will be admissible after the PET/CET.

38. Impersonation is a punishable offence. No candidate will be permitted to appear in PET/CET without the Admit Card. The admit card should be presented to the invigilator(s) for verification. The candidate's identity will be verified in respect of his/her details on the admit card/centre verification record. If the identity is doubtful, the candidate may not be allowed to appear in the examination. The authorities may permit the candidates to appear for the examination after completing the necessary formalities (visible mark of identification) at their discretion. No extra time will be allowed for these formalities to be completed. Police action will be initiated in case of dubious identity.

39. In case of non receipt of Admit Card the candidate may contact Office of Controller of Examinations (Operations) at GGSIP University, Sector 16C , Dwarka, New Delhi 110078 at least 3 days before the scheduled commencement of respective PET/CET. The application in this regard must be supported by a copy of the printed version of the application form and proof of payment of requisite fee for the PET/CET. Without the submission of these two documents, no application in regard to non-receipt of admit cards shall be entertained, the application in this regard shall be deemed incomplete and rejected without intimation to the applicant.

40. Instructions for the PET / CET:

1. The Entrance Test shall be based on the topics as specified in the PET/CET syllabus / School wise details section.

2. The candidates are required to report at their respective Examination Centre at least half an hour before the PET/CET along with two copies of their Admit Card issued by the University. No candidate will be allowed to enter the PET/CET Centre after the scheduled commencement of exam.

3. Entry into the examination centre or hall after the scheduled commencement of examinations / test shall be deemed as usage of unfair means. The candidature of such candidates shall be summarily cancelled on the basis of the report of the centre superintendent and / or the University Representative at the examination centre.

4. Each candidate will be given a sealed Test Booklet and OMR answer sheet five minutes before the commencement of the test.

5. The OMR answer sheet is of special type which will be scanned by an optical scanner.

6. Immediately on receipt of the Test Booklet, each candidate shall fill in the required particulars on the cover page of the Test Booklet with a black ballpoint pen only. He/she shall not open the seal of the Test Booklet until asked to do so by the invigilator.

7. Candidates will then write the required particulars on OMR answer sheet with a black ballpoint pen. After this, they will wait for the signal by the invigilator to start marking the responses.

8. The Test will start exactly at the time mentioned on the Admit Card and an announcement to start will be made by the invigilator.

9. While the test is in progress, the invigilator will check the Admit Cards of the candidates to satisfy himself/herself about the identity of each candidate. The invigilator will also put his/her signature in the space provided for the purpose on the OMR answer sheet as well as on the Admit Card.

10. The candidate will have to sign the Attendance Sheet against his/her PET/CET Roll Number.

11. A signal will be given at the beginning of the Test. A signal will also be given at the closing time when the candidates must stop marking the responses.

12. After completing the Test and before handing over the Test Booklet and the OMR answer sheet to the invigilator, the candidates are advised to make sure that all the particulars required in the Test Booklet and the OMR answer sheet have been correctly written, i.e. PET/CET Roll Number, Name of the Candidate, PET/CET Code, Centre Code, Test Booklet Number, Test Booklet Code, PET/CET name.

13. No candidate will move out of the examination hall until the time prescribed for the Test is over.

14. No candidate will take away the Test Booklet and/or the OMR answer sheet from the examination hall. Taking away of the test booklet or the OMR answersheet shall be treated as the usage of unfair means.

15. A candidate must bring his/her own black ball point pen to fill the answers in ovals of OMR answer sheet. In case the ovals are filled by any instrument other than the black ball point pen, then the answer sheet may be rejected by the optical scanner when the same is being scanned. In all such cases, the responsibility shall rest on the candidates.

16. The candidate must ensure that the answer sheet is not folded. Also, he/she should not make any mark or write any kind of description on it.

17. Candidates are advised to be sure about the correct answer before they darken the oval with black ball point pen. They should also ensure that each oval is completely darkened with black ball point pen, partially or faintly darkened ovals may be rejected by the optical scanner. It may also be negatively marked.

18. A question in which multiple ovals are darkened shall be deemed to be answered wrong.

19. The Test Booklet Code filled in by the candidate in the OMR answer-sheet will be accepted as final for the purpose of evaluation. When the space for the Booklet Code is left blank or more than one booklet code is indicated therein, it will be deemed to be an incorrect booklet code and the answer sheet will not be evaluated. The candidate himself/herself will be solely responsible for all the consequences arising out of any error or omission in writing the Test Booklet Code.

20. No candidate should do any rough work on the OMR answer-sheet. Rough work, if any, is to be done only in the Test Booklet at the space provided.

21. Candidates should check to make sure that the Test Booklet contains the number of pages as mentioned on the top of the first page. In case the numbers do not tally, it should be immediately brought to the notice of the invigilator. The candidates shall not remove any page(s) from the Test Booklet and if any page(s) is (are) found missing from a candidate's booklet, he/she shall be liable for prosecution under relevant provisions of Indian Penal Code.

22. In case of any confusion, invigilator may be contacted.

23. No candidate, without the specific permission of the Centre Superintendent or the invigilator concerned, shall leave his/her seat in the examination hall until he/she has finished his/ her paper and handed over the Test Booklet and the OMR answer-sheet to the invigilator on duty. Failure to do so may be treated as usage of unfair means.

24. Smoking in the examination hall during the hours of the Test is strictly prohibited.

25. Tea, coffee, cold drinks or snacks are not allowed inside the examination hall during the Test.

26. Candidates shall maintain perfect silence and attend to their papers only. Any conversation, gesticulation or causing disturbance in the examination will be deemed to be an act of misbehaviour and is, therefore, strictly prohibited. Also, if a candidate is found impersonating or using unfair means, his/ her candidature shall be cancelled and he/she will be liable to be debarred from taking the entrance tests either permanently or for a specified period depending upon the nature of the offense, in addition to any other action which may be taken under the Indian Penal Code.

27. If any candidate is found using any unfair means at any stage of admission process or does not observe discipline during the conduct of the Entrance Test, his/her candidature is liable to be cancelled, as such behaviour shall be deemed as the usage of unfair means.

28. The results of the CETs shall only be declared on the University website www.ipu.ac.in on or before the scheduled date of result declaration. There shall be no separate communication in this regard.

29. If any candidate is aggrieved by his/her declared result of CET, he/she may, within a week (at most 05 working days), apply for inspection of his/her OMR answersheet, relevant question booklet and answer key and submit specific objections / grievances in specified

performa along with a fee of Rs. 1000/- to be paid in the form of bank challan deposited at the Indian bank branch located in the University campus. Specific objections/grievances (if any) so received from the candidates, shall be put before a committee constituted for the purpose by the Controller of Examinations (Operations) of the University. On the advice of the duly constituted committee, appropriate action which may include revision of result, if necessary, shall be taken by the Controller of Examinations (Operations), of the University.

6. IMPORTANT DATES

- Start date for receipt of applications (online): 22/03/2019 (Friday)
- Last date for receipt of applications (online): 06/05/2019 (Monday) up to 4.00 p.m.
- Dates of Entrance Test : 25/05/2019 (Saturday) & 26/05/2019 (Sunday)
- Result of Entrance Test latest by 07/06/2019 (Friday) for Ph.D. & M.Phil
- Submission of documents by candidates requesting exemption from PET (at respective schools): Latest by 17th May, 2019
- List of exempted candidates from PET to be displayed on University Website: 23rd May, 2019 (by concerned schools).
- Tentative Interview Schedule: 8th to 17th July, 2019 (Final schedule to be notified on University website by concerned schools in due course)
- For M.Phil Programmes interview / practical schedule shall be notified on University website by concerned schools in due course)

7. SUBMISSION OF APPLICATION FORM

- All the candidates have to apply online for admission to Ph.D. and M.Phil. programmes by filling up the online application form as available on University website http://www.ipu.ac.in on the payment of Rupees One Thousand Only (Rs. 1000/-) plus service charges and taxes as applicable as the application fee.
- Appearing in Ph.D. Entrance Test (PET) is mandatory for all non exempted applicants (refer Point 3.2 above), however admit card would be issued to all the applicants including the exempted applicants (refer Point 3.2 above). Appearing in M.Phil. CET is mandatory for all M.Phil. applicants
- All the applicants need to download the admit card from the link used for filling up the application form using their respective login id and password. The applicants who are exempted from Ph.D. Entrance Test should keep the admit card with them and the same has to be produced at the time of interview. The candidates are advised to take and retain a printout of the duly filled in application form.

The link for filling up the online application is as follows:

Homepage: http://www.ipu.ac.in

➡ Admission 2019 ➡ Apply Online

Note: Last date for submission of online application form: 06/05/2019 up to 4.00 P.M.

8. Instructions for filling up Ph.D. / M.Phil. Application Form:

1. The candidates must read all the important instructions before filling up the Application Form.

2. A detailed procedure for filling up the application form is available on University website http://www.ipu.ac.in under the link "Procedure to fill online application forms."

3. The candidate should choose the "Exam Category" as "Ph.D / M.Phil" in the online application form.

4. The candidate should enter his or her relevant details and upload a recent clear photograph of size as mentioned with his or her scanned signature and left thumb impression.

5. Relevant course for Ph.D. Entrance Test / M.Phil. CET should be chosen and payment of application fee of Rs 1000/- (Rs. One Thousand only) plus service charges and taxes as applicable must be made online.

9. Schedule of Ph.D/M.Phil Entrance Test 2019 – 2020

Sl. No.	Test Code	Test Name	Exam Date	Exam Timings
1	211	Information Tech./ Computer Sc. & Engg./ Computer Applications	25/05/2019 (Saturday)	10.30 AM to 12.30 PM
2	231	Chemical Technology	25/05/2019 (Saturday)	10.30 AM to 12.30 PM
3	292	Sociology	25/05/2019 (Saturday)	10.30 AM to 12.30 PM
4	291	English	25/05/2019 (Saturday)	2.00 PM to 4.00 PM
5	241	Bio-Technology	25/05/2019 (Saturday)	2.00 PM to 4.00 PM
6	283	Physics	25/05/2019 (Saturday)	2.00 PM to 4.00 PM
7	301	Law and Legal Studies	25/05/2019 (Saturday)	2.00 PM to 4.00 PM
8	261	Mass Communication	25/05/2019 (Saturday)	2.00 PM to 4.00 PM
9	212	Electronics & Comm. Engg.	26/05/2019 (Sunday)	10.30 AM to 12.30 PM
10	251	Environmental Sciences	26/05/2019 (Sunday)	10.30 AM to 12.30 PM
11	213	Mechanical & Automation Engg.	26/05/2019 (Sunday)	10.30 AM to 12.30 PM
12	311	Education	26/05/2019 (Sunday)	10.30 AM to 12.30 PM
13	282	Chemistry	26/05/2019 (Sunday)	2.00 PM to 4.00 PM
14	221	Management	26/05/2019 (Sunday)	2.00 PM to 4.00 PM
15	281	Mathematics	26/05/2019 (Sunday)	2.00 PM to 4.00 PM

Sl. No.	Test Code	Test Name	Exam Date	Exam Timings
1	161	M.Phil (English)	25/05/2019 (Saturday)	10.30 AM to 1.00 PM
2	157	M.Phil (Clinical Psychology)	25/05/2019 (Saturday)	10.30 AM to 1.00 PM
3	199	M.Phil (Psychiatric Social Work)	25/05/2019 (Saturday)	10.30 AM to 1.00 PM

10. Refund Policy:

Please refer to admission brochure Part – D available at University website www.ipu.ac.in

11. School-Wise Details:

11.1 University School of Biotechnology

11.1.1 Additional Eligibility Criteria:

Master's Degree (M.Sc./M.Tech) or M.Phil with Masters in Biotechnology/Life Sciences/ Botany/ Zoology/Genetics/Microbiology/Biochemistry/Plant Molecular Biology/ Biochemical Engineering / Bioinformatics/or Allied Sciences.

Or

Master's Degree (M.Sc./M.Tech) or M.Phil with Masters in Biotechnology/Life Sciences/ Botany/ Zoology/Genetics/Microbiology/Biochemistry/Plant Molecular Biology/ Biochemical Engineering / Bioinformatics/or Allied Sciences and who have cleared a national level examination like CSIR/UGC-NET-JRF, DBT-JRF, ICMR-JRF or equivalent fellowship shall be deemed to have qualified the University's written test and can appear directly for interview. Candidates who have appeared in the above examinations but are awaiting results may also apply but will not be exempted from entrance exam. Candidates who have already initiated their fellowships in some other institutions and are interested to have their fellowships transferred to GGSIP University may also apply, provided the period of available fellowship is atleast 4 years.

11.1.2.Mode of Ph.D. Programme:

Full Time

11.1.3.Syllabus for Entrance Test:

Part A - Research methodology

Scientific Research: Meaning and characteristics of scientific research; Validity in research; Phases or stages in research; Various types of research: Quantitative, Qualitative, Experimental, Exploratory, Empirical, Descriptive, Ex-post facto, Case studies.

Review of literature: Purpose of the review, Sources of the review, Citing references, Ethical and IPR issues in research.

Data representation: Collection of data, Tabulation, Organization and graphical representation of quantitative data: Line Graphs, Bar Graphs, Pie Charts, Histograms; Probability concept and theories.

Sampling: Meaning and types of sampling, Probability and Non probability Sampling. Methods of drawing random samples, requisites of good sampling methods, Sample size, Sampling error.

Hypothesis testing: Null hypothesis, Alternate hypothesis, Steps of hypothesis testing, Level of significance, Type I and Type II error.

Measures of Variability: Range; Quartile Deviation; Standard Deviation; Average Deviation; and Coefficient of Variation; Measures of Relative position: Percentiles, Percentiles Ranks, Standard Scores, Stanine Scores, T- Scores; Normal Probability Distribution, properties of normal curve, applications of normal curve, Divergence from Normality : Skewness and Kurtosis.

Correlation and Regression: Karl Pearson's correlation Coefficient(r), Spearman's rank order correlation coefficient (rho), Partial and Multiple Correlation, Scatter diagrams, Regression and Prediction, Regression equations, linear regression, multiple regression analysis, Cause and effect- Path analysis

Statistical inference: Concept of Standard Error and it's uses; The Significance of Statistical Measures; Tests of Significance of Difference between two means Z-Test, T-test; Analysis of variance and analysis of covariance: Assumptions of Anova, One way Anova, Two way Anova, Post Hoc tests- Duncan's multiple range test, Tukey's test, Newmann-Keuls test; Non-parametric Tests: Chi-square test, Medium test, Mann Whitney U test, Kolmogorov-Smirnov two sample test; Multivariate analysis: Factor analysis, Cluster analysis and Discriminant analysis.

Experimental Designs: Meaning and purpose of research design, Criteria of research design, Basic principles of experimental design, General layout and Anova of experimental designs: Completely Randomized Design, Randomized Block Design, Latin Square Design, Split Plot, Factorial designs.

Preparation of Thesis: Introduction to scientific writing, Introduction to different softwares used for thesis preparation

Part B – Biotechnology (Subject Specific Test)

Biochemistry: Organization of life; Importance of water; Structure and function of biomolecules: Amino acids, Carbohydrates, Lipids, Proteins and Nucleic acids; Protein structure, folding and function

Enzyme classification, kinetics including its regulation and inhibition, Vitamins and Coenzymes; Metabolism and bioenergetics; Generation and utilization of ATP; Metabolic pathways and their regulation: glycolysis, TCA cycle (Krebs' cycle), glycolysis, pentose phosphate pathway, oxidative phosphorylation, electron transport chain; gluconeogenesis,

glycogen and fatty acid metabolism; Metabolism of nitrogen containing compounds: nitrogen fixation, amino acids and nucleotides. Photosynthesis: Calvin cycle, C4 Cycle, CAM

Cell Biology: Cell structure and organelles; Biological membranes; Transport across membranes; Signal transduction; Hormones and neurotransmitters; Prokaryotic and eukaryotic cell structure; Cell cycle, cell division and cell growth control; Cell-Cell communication, Cell signaling and signal transduction

Molecular Biology and Genetics: Molecular structure of genes and chromosomes; Mutations and mutagenesis; Nucleic acid replication, transcription, translation and their regulatory mechanisms in prokaryotes and eukaryotes; Mendelian inheritance; organization of genome, sex determination and sex-linked characteristics, cytoplasmic inheritance, linkage, recombination and mapping of genes in eukaryotes, population genetics. Gene interaction; Complementation; Linkage, recombination and chromosome mapping; Extra chromosomal inheritance; Microbial genetics (plasmids, transformation, transduction, conjugation); Viruses, Retroviruses; Transposable elements; RNA interference; DNA damage and repair; Chromosomal variation; Molecular basis of genetic diseases Microarray, PCR, site directed mutagenesis, microarray, DNA sequencing

Analytical Techniques: Principles of microscopy-light, electron, fluorescent and confocal; Centrifugation- high speed and ultra; Principles of spectroscopy-UV, visible, CD, IR, FTIR, Raman, MS, NMR; Principles of chromatography- ion exchange, gel filtration, hydrophobic interaction, affinity, GC,HPLC, FPLC; Electrophoresis; Flowcytometry

Immunology: History of Immunology, Active and passive immunity; Innate, humoral and cell mediated immunity; Antigen; Antibody structure and function; Molecular basis of antibody diversity; Synthesis of antibody and secretion; Antigen-antibody reaction; Complement; Primary and secondary lymphoid organ; B and T cells and macrophages; Major histocompatibility complex (MHC); T cell receptor; Antigen processing and presentation; Polyclonal and monoclonal antibody; Regulation of immune response; Immune tolerance; Hypersensitivity; Autoimmunity; Graft versus host reaction. Immunological techniques: Immunodiffusion, immunoelectrophoresis, RIA and ELISA.

Bioinformatics: Major bioinformatic resources and search tools; Sequence and structure databases; Sequence analysis (biomolecular sequence file formats, scoring matrices, sequence alignment, phylogeny); Data mining and analytical tools for genomic and proteomic studies; Molecular dynamics and simulations (basic concepts including force fields, protein-protein, protein-nucleic acid, protein-ligand interaction)

Recombinant DNA Technology: Restriction and modification enzymes; Vectors; plasmid, bacteriophage and other viral vectors, cosmids, Ti plasmid, yeast artificial chromosome; mammalian and plant expression vectors; cDNA and genomic DNA library; Gene isolation, cloning and expression; Transposons and gene targeting; DNA labeling; DNA fingerprinting;

Southern and northern blotting; In-situ hybridization; RAPD, RFLP, AFLP, SSRs, SNPs; Gene transfer technologies; Gene therapy

Plant and Animal Biotechnology: Totipotency; Regeneration of plants; Plant growth regulators and elicitors; Tissue culture and Cell suspension culture system: methodology, kinetics of growth and, nutrient optimization; Production of secondary metabolites by plant suspension cultures; Hairy root culture; transgenic plants; Plant products of industrial importance; Animal cell culture, media composition and growth conditions; Animal cell and tissue preservation; Anchorage and non-anchorage dependent cell culture; Kinetics of cell growth; Micro & macro-carrier culture; Hybridoma technology; Stem cell technology; Animal cloning; Transgenic plants and animals

Bioprocess Engineering and Process Biotechnology: Chemical engineering principles applied to biological system, Principle of reactor design, ideal and non-ideal multiphase bioreactors, mass and heat transfer; Rheology of fermentation fluids, Aeration and agitation; Media formulation and optimization; Kinetics of microbial growth, substrate utilization and product formation; Sterilization of air and media; Batch, fed-batch and continuous processes; Various types of microbial and enzyme reactors; Instrumentation control and optimization; Unit operations in solid-liquid separation and liquid-liquid extraction; Process scale-up, economics and feasibility analysis

Engineering principle of bioprocessing: Upstream production and downstream; Bioprocess design and development from lab to industrial scale; Microbial, animal and plant cell culture platforms; Production of biomass and primary/secondary metabolites; Biofuels, Bioplastics, industrial enzymes, antibiotics; Large scale production and purification of recombinant proteins; Industrial application of chromatographic and membrane based bioseparation methods; Immobilization of biocatalysts (enzymes and cells) for bioconversion processes; Bioremediation-Aerobic and anaerobic processes for stabilization of solid / liquid wastes.

Evolution: Origin and history of life on earth, theories of evolution, natural selection, adaptation, speciation.

Developmental Biology: Embryonic development, cellular differentiation, organogenesis, metamorphosis, genetic basis of development,

Microbiology: Discovery of microbial world: Landmark discoveries relevant to the field of microbiology; Controversy over spontaneous generation; Role of microorganisms in transformation of organic matter and in the causation of diseases. Methods in Microbiology: Pure culture techniques; Theory and practice of sterilization; Principles of microbial nutrition; Enrichment culture techniques for isolation of microorganisms; Light-, phase contrast- and electron-microscopy. Microbial Taxonomy and Diversity: Bacteria, Archea and their broad classification; Eukaryotic microbes: Yeasts, molds and protozoa; Viruses and their classification; Molecular approaches to microbial taxonomy. Microbial

Growth:Definition of growth; Growth curve; Mathematical expression of exponential growth phase; Measurement of growth and growth yields; Synchronous growth; Continuous culture; Effect of environmental factors on growth. Control of Micro-organisms: Effect of physical and chemical agents; Evaluation of effectiveness of antimicrobial agents. Microbial Diseases and Host Pathogen Interaction: Normal microbiota; Classification of infectious diseases; Reservoirs of infection; Nosocomial infection; Emerging infectious diseases; Mechanism of microbial pathogenicity; Nonspecific defense of host; Vaccines; Immune deficiency; Human diseases caused by viruses, bacteria, and pathogenic fungi; Chemotherapy/Antibiotics: General characteristics of antimicrobial drugs; Antibiotics: Classification, mode of action and resistance; Antifungal and antiviral drugs; Microbial Ecology: Microbial interactions; Carbon, sulphur and nitrogen cycles; Soil microorganisms associated with vascular plants.

Plant Systematics: Nomenclature; Major systems of classification, plant groups, phylogenetic relationships and molecular systematics.

Plant Anatomy: Plant cell structure and its components; cell wall and membranes; organization, organelles, cytoskeleton, anatomy of root, stem and leaves, floral parts, embryo and young seedlings, meristems, vascular system, their ontogeny, structure and functions, secondary growth in plants and stellar organization.

Plant Morphogenesis & Development: Life cycle of angiosperms, pollination, fertilization, embryogenesis, seed formation, seed storage proteins, seed dormancy and germination.

Plant Physiology: Plant water relations, transport of minerals and solutes, stress physiology, stomatal physiology, signal transduction, N2 metabolism, photosynthesis, photorespiration; respiration, Flowering: photoperiodism and vernalization, biochemical mechanisms involved in flowering; molecular mechanism of senencensce and aging, biosynthesis, mechanism of action and physiological effects of plant growth regulators

Plant Breeding and Genetic Modification: Principles, methods – selection, hybridization, heterosis; male sterility, genetic maps and molecular markers, sporophytic and gametophytic self incompability, haploidy, triploidy, somatic cell hybridization, marker-assisted selection, gene transfer methods viz. direct and vector-mediated, plastid transformation, transgenic plants and their application in agriculture, molecular pharming, plantibodies.

Economic Botany: A general account of economically and medicinally important plants-cereals, pulses, plants yielding fibers, timber, sugar, beverages, oils, rubber, pigments, dyes, gums, drugs and narcotics; Economic importance of algae, fungi, lichen and bacteria.

Plant Pathology: Nature and classification of plant diseases, diseases of important crops caused by fungi, bacteria,nematodes and viruses, and their control measures, mechanism(s)

of pathogenesis and resistance, molecular detection of pathogens; plant-microbe beneficial interactions.

Ecology and Environment: Ecosystems – types, dynamics, degradation, ecological succession; food chains and energy flow; vegetation types of the world, pollution and global warming, speciation and extinction, conservation strategies, cryopreservation, phytoremediation.

Food Chemistry and Nutrition: Carbohydrates: structure and functional properties of mono-, oligo-, & poly- saccharides including starch, cellulose, pectic substances and dietary fibre, gelatinization and retrogradation of starch. Proteins: classification and structure of proteins in food, biochemical changes in post mortem and tenderization of muscles. Lipids: classification and structure of lipids, rancidity, polymerization and polymorphism. Pigments: carotenoids, chlorophylls, anthocyanins, tannins and myoglobin. Food flavours: terpenes, esters, aldehydes, ketones and quinines. Enzymes: specificity, simple and inhibition kinetics, coenzymes, enzymatic and non- enzymatic browning. Nutrition: balanced diet, essential amino acids and essential fatty acids, protein efficiency ratio, water soluble and fat soluble vitamins, role of minerals in nutrition, co-factors, anti-nutrients, nutraceuticals, nutrient deficiency diseases. Chemical and biochemical changes: changes occur in foods during different processing. Food Microbiology: Characteristics of microorganisms: morphology of bacteria, yeast, mold and actinomycetes, spores and vegetative cells, gram-staining. Microbial growt h: growth and death kinetics, serial dilution technique. Food spoilage: spoilage microorganisms in different food products including milk, fish, meat, egg, cereals and their products. Toxins from microbes: pathogens and non-pathogens including Staphylococcus, Salmonella, Shigella, Escherichia, Bacillus, Clostridium, and Aspergillus genera. Fermented foods and beverages: curd, yoghurt, cheese, pickles, soya-sauce, sauerkraut, idli, dosa, vinegar, alcoholic beverages and sausage.

Food Products Technology: Processing principles: thermal processing, chilling, freezing, dehydration, addition of preservatives and food additives, irradiation, fermentation, hurdle technology, intermediate moisture foods. Food pack aging and storage: packaging materials, aseptic packaging, controlled and modified atmosphere storage. Cereal processing and products: milling of rice, wheat, and maize, parboiling of paddy, bread, biscuits, extruded products and ready to eat breakfast cereals. Oil processing: expelling, solvent extraction, refining and hydrogenation. Fruits and vegetables processing: extraction, clarification, concentration and packaging of fruit juice, jam, jelly, marmalade, squash, candies, tomato sauce, ketchup, and puree, potato chips, pickles. Plantation crops processing and products: tea, coffee, cocoa, spice, extraction of essential oils and oleoresins from spices. Milk and milk products processing: pasteurization and sterilization, cream, butter, ghee, ice- cream, cheese and milk powder. Processing of animal products: drying, canning, and freezing of fish and meat; production of egg powder. Waste utilization: pectin from fruit wastes, uses of by-

products from rice milling. Food standards and quality maintenance: FPO, PFA, Agmark, ISI, HACCP, food plant sanitation and cleaning in place (CIP).

11.2 University School of Chemical Technology

11.2.1.Additional Eligibility Criteria:

The minimum eligibility for admission shall be as per mentioned in clause 1 of admission brochure in the relevant field.

11.2.2. Mode of Ph. D. Programme :

Full Time/Part Time

11.2.3. Syllabus for Entrance Test :

Part A - Research Methodology

Introduction to Statistics: Statistical concept, Statistical Inference, Statistical Hypotheses, Statistical Estimation, Point Estimates, Interval Estimates, Frequency Distributions, Quantitative Data Graphs, Qualitative Data Graphs, Graphical Depiction of Two-Variable, Numerical Data: Scatter Plots.

Descriptive Statistics: Measures of Central Tendency-mean-median-mode, Measures of Variability, Data-range-variance-standard deviation, Analysis of frequency distributions with equal means but different variances, Measures of Central Tendency and Variability-Grouped Data, Measures of Shape, Tests and Estimates on Statistical Variance, Analysis of Variance.

Distributions: Description of Discrete Distribution, Binomial Distribution, Poisson distribution, Description of Continuous Distributions, Normal Distribution, Exponential Distribution.

Regression analysis: Simple Linear Regression, Multiple Regression, Polynomial Regression, Nonlinear Regression.

Research Ethics: Research honesty and integrity, authorship, acknowledgement and citation, funding agencies and sponsorship, sources of data, sensitive materials and safety, patents and copyright, confidentiality and privacy, human rights, environmental laws, fabrication of data and misrepresentation, plagiarism.

Part B - Chemical Technology (Subject Specific Test)

Process Calculations

Steady and unsteady state mass and energy balances including multiphase, multicomponent, reacting and non-reacting systems. Use of tie components; recycle, bypass and purge calculations; Gibb's phase rule and degree of freedom analysis.

Thermodynamics

First and Second laws of thermodynamics. Applications of first law to close and open systems. Second law and Entropy. Thermodynamic properties of pure substances: Equation of State and residual properties, properties of mixtures: partial molar properties, fugacity, excess properties and activity coefficients; phase equilibria: predicting VLE of systems; chemical reaction equilibrium.

Fluid Mechanics

Fluid statics, Newtonian and non-Newtonian fluids, shell-balances including differential form of Bernoulli equation and energy balance, Macroscopic friction factors, dimensional analysis and similitude, flow through pipeline systems, flow meters, pumps and compressors, elementary boundary layer theory, flow past immersed bodies including packed and fluidized beds, Turbulent flow: fluctuating velocity, universal velocity profile and pressure drop.

Mechanical Operations

Particle size and shape, particle size distribution, size reduction and classification of solid particles; free and hindered settling; centrifuge and cyclones; thickening and classification, filtration, agitation and mixing; conveying of solids.

Heat Transfer

Steady and unsteady heat conduction, convection and radiation, thermal boundary layer and heat transfer coefficients, boiling, condensation and evaporation; types of heat exchangers and evaporators and their process calculations. Design of double pipe, shell and tube heat exchangers, and single and multiple effect evaporators.

Mass Transfer

Fick's laws, molecular diffusion in fluids, mass transfer coefficients, film, penetration and surface renewal theories; momentum, heat and mass transfer analogies; stage-wise and continuous contacting and stage efficiencies; HTU & NTU concepts; design and operation of equipment for distillation, absorption, leaching, liquid-liquid extraction, drying, humidification, dehumidification and adsorption.

Chemical Reaction Engineering

Theories of reaction rates; kinetics of homogeneous reactions, interpretation of kinetic data, single and multiple reactions in ideal reactors, non-ideal reactors; residence time

distribution, single parameter model; non-isothermal reactors; kinetics of heterogeneous catalytic reactions; diffusion effects in catalysis.

Instrumentation and Process Control

Measurement of process variables; sensors, transducers and their dynamics, process modeling and linearization, transfer functions and dynamic responses of various systems, systems with inverse response, process reaction curve, controller modes (P, PI, and PID); control valves; analysis of closed loop systems including stability, frequency response, controller tuning, cascade and feed forward control.

Plant Design and Economics

Principles of process economics and cost estimation including depreciation and total annualized cost, cost indices, rate of return, payback period, discounted cash flow, optimization in process design and sizing of chemical engineering equipments such as compressors, heat exchangers, multistage contactors.

Chemical Technology

Inorganic chemical industries (sulfuric acid, phosphoric acid, chlor-alkali industry), fertilizers (Ammonia, Urea, SSP and TSP); natural products industries (Pulp and Paper, Sugar, Oil, and Fats); petroleum refining and petrochemicals; polymerization industries (polyethylene, polypropylene, PVC and polyester synthetic fibers).

11.3 University School of Management Studies

11.3.1.Additional Eligibility Criteria :

Candidates for admission to the Ph. D. programme shall have a Master Degree in Management or related field at Master degree shall be taken as eligibility. Programme and a professional degree declared equivalent to the Master's degree by the corresponding statutory regulatory body, with at least 55% marks in aggregate or its equivalent grade *B" in the UGC 7 -point scale (or an equivalent grade in a point scale wherever grading system is followed) or an equivalent degree from a foreign educational Institution accredited by an Assessment and Accreditation Agency which is approved, recognized or authorized by an authority, established or incorporated under a law in its home country or any other statutory authority in that country for the purpose of assessing accrediting or assuring quality and standards of educational institutions. Candidates for admission to the Ph. D. Programme shall have a Master Degree in Management field or related fields like Master's in Economics/Master's in Psychology/Master's in Sociology/Master's in Commerce/Master's in Operation Research/Master's in Statistics/Master's in IT and Computer Applications are eligible for Ph. D. Further more there are certain sectoral MBA Programme such as MBA

(Rural Management), MBA (Real Estate). MBA (Energy Management). MBA (Environment Management). MBA (Disaster Management). MBA (Health Care Management) or Master's in Hospital Administration / MBA (Banking & Insurance) & the like shall also be eligible for Ph. D. Programme. A relaxation of 5 % of marks, from 55 % to 50 % or an equivalent relaxation of grade, shall be allowed for those belonging to SC/ST/Differently-Abled (PWD) categories.

11.3.2.Mode of Ph. D. Programme :

Full Time/Part Time

11.3.3.Syllabus for Entrance Test :

Part A – Research Methodology

Measures of Central Tendency, Measures of Dispersion, Probability Theory; Probability distributions Discrete & Continuous – Binomial, Poisson, Normal and Exponential; Correlation and Regression analysis, Types of research, process of research, formulation of research problem, research hypothesis, Research Designs- Functions, exploratory, descriptive, experimental; Experimental research designs-pre-experimental, quasi-experimental, true experimental, statistical research design, validity of research instruments-face, content and construct validity; Reliability of research instruments, Methods of data collection- primary and secondary sources; Attitudinal scales, Sampling-concept, designs, types of sampling design, sampling frame, sample size determination, Data analysis-univariate, bivariate, multivariate; Hypothesis Testing, types of errors, Parametric vs. Non Parametric tests, Multiple Regression Analysis, Time series and Index numbers, Statistical Quality Control, Advanced Data Analytics- Exploratory Factor Analysis, Confirmatory Factor Analysis, Overview of Partial Least Square technique (PLS), Advanced Hierarchical Progression technique (AHP), Data Envelopment Analysis (DEA); Use of Computers in statistical analysis, Research Ethics.

Part B – Management (Subject Specific Test)

Managerial Economics- Demand Analysis; Production Function; Cost-Output Relations; Market Structures; Pricing Theories; Macro-Economics; Classical, Neo – Classical and Modern Theories of Organizational Structure, Personality, Perception, Values, Attitudes, Learning, Motivation of employees; Interpersonal behaviour and group dynamics, Communication, Leadership, Managing conflicts, Organizational Development., Human Resource Planning, Job analysis, Selecting Human Resources; Induction, Training and Development; Performance Appraisal and Evaluation; Potential Assessment; Job Evaluation; Wage Determination; Industrial Relations and Trade Unions; Financial Management – Nature and Scope; Valuation Concepts and Valuation of Securities; Capital Budgeting Decisions – Risk Analysis; Capital Structure and Cost of Capital; Dividend Policy – Determinants; Long-Term and Short Term Financing Instruments; Mergers and Acquisitions.,

Marketing Environment; Understanding Consumer and Industrial Markets; Demand Measurement and Forecasting; Market Segmentation, Targeting and Positioning; Product Decisions, Pricing Methods and Strategies; Promotion Decisions, Evaluation and Control of Marketing Effort; Marketing of Services; Customer Relation Management; Uses of Internet in Marketing, Information systems; System analysis and design; Trends in Information Technology, Knowledge Management, Business Intelligence, Data Analytics.

Role and Scope of Production Management and Operations Research; Facility Location; Layout Planning and Analysis; Production Planning and Linear Programming; Sensitivity Analysis; Duality; Transportation Model; Inventory Control; Queueing Theory; Decision Theory; Markov Analysis; PERT / CPM., Concept of Corporate Strategy; Strategic Management Process, Porter's Generic Strategies; Competitor Analysis; Industry Analysis; Strategies in Industry Evolution, Fragmentation, Maturity, and decline; Global Entry Strategies; Globalisation of Financial System and Services; Innovation and Entrepreneurship; Small business – Concepts, Government policy for promotion of small and micro enterprises; Managing small enterprises; Intrapreneurship (Organisational Entrepreneurship), Social responsibilities of business; Corporate governance and ethics.

11.4 University School of Environment Management

11.4.1.Additional Eligibility Criteria :

M.Sc. Environmental Science/Environment Management/Natural Resource Management/ Biodiversity & Conservation/Life Sciences/Botany/Zoology/Physical Sciences/Chemical Sciences/ M.Tech Engineering/Sciences,

Graduation in Sciences/Engineering is mandatory.

11.4.2.Mode of Ph. D. Programme :

Full Time

11.4.3.Syllabus for Entrance Test :

Part A – Research Methodology

1. Environmental Statistics and Research Design

Statistics: Probability, Measures of central tendency and their attributes, Descriptive statistics and Measurement Scales, Control Chart, Confidence interval, estimation of Mean, Tests of Hypothesis, Normal probability distribution, Z test with known variance, Sample t test: Correlation and Linear regression.

Sampling Design: deliberate, simple random, systematic, stratified, quota and cluster sampling, method of selecting Sample size, location and time.

Research Design: probability/non-probability design, exploratory/Formulative research, informal/Formal Design.

2. Instrumentation in Environmental Studies

Principles of photometry, laws governing photometry (Beer's and Lambert's Law), basics of Colorimeter and Spectrophometer, fundamentals of Chromatography, thin layer chromatography (TLC), Gas Chromatography (GC), HPLC, Flame Photometer, atomic absorption spectroscopy.

Principles of microscopy: microtomy, compound microscopy, Basic principles of Scanning Electron Microscopy (SEM), principle, methodology and applications of electrophoresis, Polymerase Chain Reaction (PCR), cryopreservation.;

3. Ecological Methods

Phyto-sociological studies: vegetational study through survey methods- frequency, density, abundance, cover and basal area, IVI, dispersion; species diversity assessment through quadrat method, point centre quarter method, biodiversity assessment and indices- Shannon-Wiener index, Simpson's Diversity Index, alpha, beta and gamma diversity.

Assessment of forest vegetation- vegetation profile, canopy cover measurement, tree height and biomass assessment, tree carbon assessment, leaf area index (LAI).

Ethnobotanical and enthnobiological survey method, walk through transect method.

Assessment of ecological parameters of wetland ecosystem (physical, chemical biological)

Field Techniques in wildlife studies: line/belt transect, Quadrat sampling, point count, scan sampling, focal sampling, Ad libitum sampling, wildlife telemetry, remotely triggered camera trapping, avian acoustics, population estimation methods, mark-recapture for closed populations, distance based sampling.

Socio- Economic Survey methods, participatory rural appraisals (PRA) methods, valuation of ecosystem services- travel cost method, market Price Method, Surrogate Market Approaches, Hedonic Pricing, Contingent Valuation method.

4. Environmental Analytical Methods

Air analysis: Objectives of air quality monitoring, location of sampling stations, physical site factors, period, frequency and duration of sampling. common sampling procedures and equipment, respirable dust sampler, monitoring of SO2, West and Gaeke method,

monitoring of NO2, Jacobs and Hochheiser method, methods of CO monitoring, infrared CO analyser.

Water analysis: aims and objectives of water pollution monitoring, suspended solids, hardness, turbidity, TDS, pH, Eh, dissolved oxygen, BOD and COD monitoring, oil and grease, metals and persistent organic pollutants.

Soil analysis: color, texture, bulk density, soil conductivity, soil analysis for available phosphorus, nitrogen potassium, sulphur and estimation of soil organic carbon.

5. Taxonomy and Biogeography

Field collection, equipments, preservation and identification techniques of aquatic and terrestrial plant groups; herbarium handling and data Information Systems; herbarium policies; major herbaria, Botanical Gardens and Zoological Gardens/Zoo of the World and their significance in taxonomic research. Collection and preservation of curating specimens of various animal groups. use of taxonomic literature; taxonomic keys; identification through websites/internet.

6. Environmental Microbial Technology

Sterilization Methods: heat sterilization, radiation, filtration and chemical sterilization, principles of autoclave and biosafety cabinet, disinfection.

Culture Media: types-complex and defined media, role of various components, differential and selective media, solid media.

Basic Microbial Techniques: streaking, spreading, slant preparation, colony forming units, MPN method for coliforms, Gram staining, aseptic techniques.

Basic features of bacteria, fungi and algae, bacteria growth curve.

Instruments for basic microbiological studies: incubator, Laminar Flow, autoclave centrifuge, incubator shaker.

7. Remote Sensing and GIS Techniques

Basics and Principles of Remote Sensing, Electromagnetic spectrum, spectral signature, remote sensing platforms, Digital image processing, Image characteristics and interpretation. Basics and Principles of GIS, GIS data model. Functions of raster and vector data models. Applications of Remote Sensing and GIS in environment, natural resources and disaster management.

Part B - Environmental Sciences (Subject Specific Test)

8. General Environment and Ecology

Scope and application of Environmental Science.

Ecological Factors: Concept of limiting factors. biotic and abiotic factors.

Population Ecology: Properties of population, growth models, demographic model, concept of carrying capacity.

Community Ecology: Community structure, types of interaction between species, concept of habitat, niche and guild.

Ecosystem: Concept, trophic structure, energy flow, nutrient cycling, ecological foot print. Ecological succession, ecosystem regulation, integrity and resilience, Urban ecosystem, Ecosystem services.

Concepts of landscape ecology and its elements; ecosystem restoration.

9. Natural Resources

Classification of natural resources, ecological, social and economic dimension of resource management.

Land resources: Land as a resource. types of soils, properties, formation and distribution, soil erosion, soil conservation; mineral resources-types and uses.

Forest resources: Major forest types and their characteristics, forest ecology, afforestation, regeneration, sustainable forest management, deforestation, non-timber forest products.

Water resources: Properties of lentic and lotic aquatic resources, conflicts over water, wetlands, rain water harvesting.

Energy resources: Conventional energy resources, fossil fuels and their classification, characteristics of coal, petroleum and natural gas, Nuclear fission and fusion nuclear reactors.

Non–conventional renewable energy sources: solar energy, wind energy, geo-thermal, hydropower generation, tidal and Ocean Thermal Energy Conversion (OTEC), hydrogen energy, biomass conversion technologies, gasification of biomass, biogas technology.

Food resources: World food scenario, Environmental impacts of modern agriculture, Fish and other aquatic resources.

10. Environmental Pollution

Air Pollution: air quality and emission standards, primary and secondary pollutants, Air Quality Index, Environmental and adiabatic lapse rates, temperature inversion and atmospheric stability, transport and diffusion of pollutants.

Stationery and mobile sources, air pollution control methods, photochemical smog, acid rain health impacts of air pollutants.

Noise pollution: Sources of noise exposure, noise standards and noise control measures.

Water Pollution: Sources and impacts of water pollution, water quality standards, physcio-chemical and bacteriological characteristics of water, eutrophication, ground and surface water pollution, thermal pollution of water; water and wastewater treatment technologies.

Soil Pollution: Soil contaminants and Bioremediation of contaminated soils, soil salinity, bioreclamation of degraded soils.

11. Biodiversity and Conservation

Biodiversity –definition, levels and types; scope of biodiversity science, genetic diversity, species diversity, ecosystem diversity, landscape diversity, agro-biodiversity, bio-cultural diversity and urban biodiversity

History of the earth and biodiversity patterns through geological times, speciation, current centers of biodiversity, biodiversity hotspots in India and world

Value of Biodiversity: direct and indirect value of biodiversity, ecotourism, biodiversity and religion

Flora and Fauna of India

Threats to biodiversity: habitat destruction, fragmentation, transformation, degradation and loss of land and aquatic systems

Invasive species and biological impacts of invasive species on terrestrial and aquatic systems

Extinction and biological crisis; IUCN threatened categories.

Conservation strategies: principles and network of protected Areas, establishment and need for comprehensive, threats to protected areas; community conserved Areas (CCAs), in-situ and ex-situ conservation.

12. Taxonomy, Biosystematics and Evolution

Introduction and Basic principles of taxonomy (identification, description and nomenclature) and systematic, significance of systematics, The International Code of Nomenclature (ICBN/ICN). The International Code of Nomenclature of Bacteria (ICNB) or bacteriological Code (BC), phylogenetic Code of Classification(Phylocode), introduction to phenetic methods (Taxometrics), Phylogenetic Methods (Cladistics), molecular systematic, Major systems of classification of plants, animals and microbes

Origin and Evolution of Species, Taxonomy in the implementation of the Convention on Biological Diversity (CBD), Global Strategy for Plant Conservation (GSPC), Global Taxonomic Initiative (GTI), National Biodiversity Strategy Action Plan (NBSAP), Global Biodiversity Information Facility (GBIF).

Introduction to Biogeography; types of Biogeography their aim and scope; physical geography of earth, phytochoria (biomes, realms), Phytogeographic regions of India.

13. Environment Policy, Conventions, Law and Environmental Impact Assessment

Constitutional provisions for environment protection in India (Article 48A, 58A); Wildlife Protection Act, 1972; Forest Conservation Act (Revised), 1982; Water (Prevention and Control of Pollution) Act, 1974, Air (Prevention and Control of Pollution) Act, 1981 as , amended 1987, Environment Protection Act, 1986; Motor Vehicle Act, 1988.

Hazardous Waste (Management and Handling) Rules, 1989; Biomedical Waste (Management and Handling) Rules, 1998, Green Tribunal Act 2010; Solid Waste (Management & Handling rules), 2000, Coastal Regulation Zone (CRZ), Wetland Regulation Rules, 2010)

Stockholm Conference 1972, Rio Declarations-Agenda 21, CITES, Montreal Protocol, Kyoto Protocol, Convention on Biological Diversity (CBD), Ramsar Convention, 1971.

Environmental Impact Assessment: definition, objectives, principles and types of EIA, Strategic Environmental Assessment (SEA), EIA methodology, environment auditing, EMS & ISO 14000, environment management plan.

14. Environmental Geosciences and Natural Disaster Management

Lithosphere, hydrosphere and atmosphere; internal structure of the earth, rock types, and soil loss equations

Renewable and non-renewable mineral resources and their distribution in India; ocean as a source of mineral resources.

Hydrological cycle and its components, watershed and its management, Geological work of air, river, glacier and ground water.

Climate of India: western disturbance, Indian monsoon, El Nino, La Nina.

Disaster Management: environmental hazards, causes and types, floods, landslides, earthquake, volcano, cyclones, tsunami, drought, forest fires and avalanche; Hyogo and Senedai Frameworks, Indian Agencies in Disaster Management, DM Act, 2005; Disaster Management Policy 2009.

15. Environment Education and Awareness

Need for Environmental education and awareness, Environmental ethics, Environment days and their significance, Environmental movements of India, Global Environmental issues, ozone depletion, global warming and climate change, Paris Agreement, sustainable development UNEP programmes toward sustainable development, Sustainable Development Goals, 2030.

Important Environmental missions of Govt. of India.

Environmental health issues and prevention.

11.5 University School of Basic & Applied Science

11.5.1.Additional Eligibility Criteria :

The minimum eligibility for admission shall be a Master's Degree in relevant field or equivalent as stipulated in clause 1 of admission brochure.

11.5.2. Mode of Ph. D. Programme :

Full Time

11.5.3.Syllabus for Entrance Test :

Part A – Research Methodology (Mathematics)

Unit-1: Basic quantitative concepts and techniques

Types of data, description of data, frequency distributions, bar, pie charts, graphs, mean, median. mode, standard deviation, error bars, dependent and independent variables, discrete and continuous random variables, probability, sample space, outliers, statistical inference, standard normal distribution, statistical significance, chi square test, comparing data, correlations, curve fitting'

This part shall contain questions-pertaining to General Aptitude with emphasis on logical reasoning, graphical analysis. analytical and numerical ability. quantitative comparison, series formation, puzzles etc.

Part B – Mathematics (Subject Specific Test)

Linear Algebra: Finite dimensional vector spaces, Linear transformations and their matrix representations, rank, systems of linear equations, eigen values and eigen vectors, minimal polynomial, Cayley-flainilton Theorem. diagonalization, Hermitian. Skew-Herrnitian and Unitary matrices. Finite dimensional inner product spaces.

Complex Analysis: Analytic functions. conformal mappings. bilinear transformations, complex integration. Cauchy's integral theorem and formula, Liouville's theorem, maximum modulus principle, Taylor and Laurent's series, residue theorem and applications for

evaluating real integrals, transcendental functions like trigonometric, exponential and Hyperbolic.

Real Analysis :Sequences and series of functions. uniform convergence. poeaer series. Fourier series. functions of several variables, maxima, minima. Rieman' integrations. multiple integrals. line, surface and volume integrals, Green's, Stokes and Gauss theorem, metric spaces, completeness, Weirstrass approximation theorem. compactness, Lebesgue measure. measurable functions, Lebesgue integral, Fatou's lemma dominated convergence theorem. Limit. continuity, Derivative, Partial Derivative.

Ordinary Differential Equations : First order ordinary differential equations, existences and uniqueness theorems, system of linear first order ordinary differential, equations, linear ordinary differential equations of higher order with constant coefficients. linear second order ordinary differential equations with variable coefficients. method of Laplace transtbrins for solving ordinary differential equations, series solutions, Legendre polynomial and Bessel functions with their properties.

,algebra: Normal subgroups and homomorphism theorems. automorphisms, Group actions. Sylow's theorems and their applications, Euclidean domains, Principle ideal domains and unique factorization domains Prime ideals and maximal ideals in commutative rings. Fields, finite fields.

Functional Analysis:Banach spaces, Hahn-Banach extension theorem, open mapping and closed graph theorems, principle of uniform boundedness, IIilbert spaces, orthonormal bases. RiCS4 representation theorem, bounded linear operators.

Numerical Analysis: Numerical solutions of algebraic and transcendental equations: bisection. secant method. Newton-Raplison method, fixed point iteration, interpolation, error of polynomial interpolations. Lagrange. Newton interpolations, numerical differentiation. numerical integration. Trepzoidal and Simpson rules. Gauss Legendre quadrature, method of undetermined parameters, le•Ft square polynomial approximation, numerical solutions of systems of linear equations, direct methods (Gauss eliminations. LU decomposition), iterative methods (Jacobi and Gauss-Seidel), matrix eigen value problems, power method, numerical solution of ordinary differential equations, initial value problems. Taylor series methods. Euler's method. Runge¬Kutta methods.

Partial Differential Equations: Linear and quasilinear first order partial differential equations. method of characteristics, second order linear equations in two variables and their classifications, Cauchy, Dirichlet and Neumann problems, solutions of Laplace. wave and diffusion equations in two variables. Fourier transform, Laplace transform.

Mechanics:Generalized coordinates. Lagrange's equations, Hamiltonian canonical equations. Hamilton's principle and principle of least action, Two Dimensional motion of rigid bodies,

Euler's dynamical equations for the motion of rigid body about an axis, Theory of small oscillations, Virtual work and moment of inertia.

Probability and Statistics: Probability space. conditional probability, Baye's theorem, independence, Random variables, joint and conditional distributions. standard probability distributions and their properties, expectations, conditional expectation. moments. Weak and Strong law of large numbers. central limit theorem. Sampling distributions. Testing of hypotheses, standard parametric tests based on normal. chi-square, t. F-distributions. Linear regression, interval estimation.

Linear programming: Linear programming problem and its formulation, convex sets and their properties. graphical method. basic feasible solution, simplex method. big-M and two phase methods, infeasible and unbounded Ll'Irs, alternate optima. Dual problem and duality theorems. dual simplex method and its application in post optimality analysis, Balanced and unbalanced transportation problems. different methods for solving transportation problems. assignment problems. Sensitivity Analysis.

NB: The syllabus for Part-A is as defined by UGC/CSIR-NETfor general aptitude paper Part A.

Part A – Research Methodology (Physics)

Unit-I: Research Ethics

Research honesty and integrity, authorship, acknowledgment and citations, funding agencies and sponsorship, sources of data, sensitive materials and safety. patents & copyright, confidentiality and privacy, animal and human rights. environmental laws, scientific misconduct - fabrication of data and misrepresentation, plagiarism.

Unit II Experimental Techniques: High Vacuum: Diffusion Pump. Turbo Molecular Pump, and Gauges for measuring high vacuum. Preparation of Materials: Crystal Growth, Amorphous materials, Nanomaterials, Polymers, Thin films. Device Fabrication: Oxidation. Diffusion, Ion Implantation, Metallization, Lithography and Etching, Bipolar and MOS device fabrication. Characterization Techniques: XRD, AFM, TEM, SEM. UV-VIS, micro-Raman, Luminescence, Ellipsometry-, NMR

Unit III Numerical and Computational techniques: Numerical solutions of differential equations - Euler's method, Runge-Kutta method, Numerical integration: Rectangular method , Simpson's rule, Root finding

Part B - Physics (Subject Specific Test)

Unit-I. Classical Mechanics: Rigid body dynamics, moment of inertia tensor, Non- inertial frames and pseudoforces, Small oscillations, normal modes, Variational principle,

Generalized coordinates, Lagrangian and Hamiltonian formalism and equations of motion, phase space dynamics.

Unit-II Quantum Mechanics: Schrődinger equation (time-dependent and time-independent). Hydrogen atom, Eigenvalue problems (particle in a box. harmonic oscillator in 3D, etc.). Tunneling through a barrier. Time independent perturbation theory and applications, WKB approximation

Unit-Ill Electrodynamics: Electric fields, potentials, Maxwell's equations in free space and linear isotropic media, boundary conditions on the fields at interfaces, Dynamics of charged particles in static and uniform electromagnetic fields, Electromagnetic waves. Radiation-from moving charges and dipoles and retarded potentials.

Unit-IV Thermodynamic and Statistical Physics: Phase space, micro- and macro-states, Micro-canonical, canonical and grand-canonical ensembles and partition functions, thermodynamical functions, Classical and quantum statistics, Ideal Bose and Fermi gases, Bose-Einstein condensation.

Unit-V Mathematical Physics: Vector calculus, Special functions and applications (Hermite, Besse!, Laguerre and Legendre functions). Fourier series, Fourier and Laplace transforms. Elements of complex analysis, analytic functions, Partial differential equations (Laplace, wave and heat equations in two and three dimensions).

Unit VI Electronics and Experimental methods: Semiconductor devices, diodes, junctions, Field effect devices, Opto-electronic devices. Operational amplifiers and their applications. Digital techniques and applications. Microprocessors and Microcontrollers.

Unit-VII Atomic & Molecular Physics: Quantum states of an electron in an atom, Spectrum of Helium and alkali atoms, hyperfine structure and isotope shift, width of spectrum lines, LS and ij coupling, Zeeman, Electronic, rotational, vibrational and Raman spectra of diatomic molecules, selection rules, Basic Lasers Physics

Unit VIII Condensed Matter Physics: Bravais lattices. Reciprocal lattice. Diffraction and the structure factor, phonons. lattice specific heat. Free electron theory and electronic specific heat. Drude model of electrical and thermal conductivity, Electron motion in a periodic potential, band theory of solids: metals, insulators and semiconductors, Superconductivity.

Part A – Research Methodology (Chemistry)

Unit-I: Types of data, description of data, frequency distributions, bar, pie charts, graphs, mean, median, mode, standard deviation, error bars, dependent and independent variables, discrete and continuous random variables, probability, sample space, outliers, statistical inference, standard normal distribution, statiscal significance, chi square test, comparing data, correlations, curve fitting.

Unit-II: Research Ethics

Research honesty and integrity, authorship, acknowledgment and citations, funding agencies and sponsorship, sources of data, sensitive materials and safety, patents & copyright, confidentially and privacy, animal and human rights, environmental laws, scientific misconduct- fabrication of data and misrepresentation, plagiarism.

Unit-III: Separation and Characterization techniques: Problems relating to structural analysis of chemical compounds and materials using, IR, UV-VIS, NMR, ESR, Mass spectroscopy, SEM-EDX, TEM and XRD (Powder and single crystal); Chromatographic techniques: GC-MS, LC-MS; Thermal analysis (TGA, DTA, DSC).

Unit-IV: Chemical Safety and Ethical Handling of Chemicals: Safe working procedure and protective environment, protective apparel. laboratory ventilation. Safe storage and use of hazardous chemicals, procedure for working with substances that pose hazards, flammable or explosive hazards, safe storage and disposal of waste chemicals, recovery, recycling and reuse of laboratory chemicals.

Part B – Chemistry (Subject Specific Test)

Organic Chemistry

1. IUPAC nomenclature of organic molecules including regio- and stereoisomers.
2. Principles of stereochcmistry: Configurational and conformational isomerism in acyclic and cyclic compounds: stereogenicity, stereoselectivity, enantioselectivity. diastereoselectivity and asymmetric induction.
3. Aromaticity: Benzenoid and non-benzenoid compounds — generation and reactions.
4. Organic reactive intermediates: Generation, stabiiiiy and reactivity of carbocations, carbanions, free radicals. carbenes, benzynes and nitrenes.
5. Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways.
6. Common named reactions and rearrangements -- applications in organic synthesis
7. Chemistry of natural products: Carbohydrates, proteins, fatty acids, nucleic acids.

Inorganic Chemistry

1. Chemical periodicity

2. Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules (VSFPR Theory).

3. Concepts of acids and bases. Hard-Soft acid base concept. Non-aqueous solvents.

4. Main group elements and their compounds: Allotropy. synthesis. Structure and bonding. Industrial importance of the compounds.

5. Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties, reaction mechanisms.

6. Organometallic compounds: synthesis, bonding and structure. and reactivity. Organometallics in homogeneous catalysis.

7. Nuclear chemistry: nuclear reactions. fission and fusion.

Physical Chemistry

1. Atomic structure and Chemical bonding in diatomics: elementary concepts of MO and VB theories.: 1 luckel theor} for conjugated It-electron systems.

2. Chemical applications of group theory: symmetry el elements point groups: character tables; selection rules. 6. Molecular spectroscopy Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities - selection rules; basic principles of magnetic resonance.

3. Chemical thermodynamics: Laws. state and path functions and their applications; thermodynamic description of various types of processes; Maxwell's relations; spontaneity and equilibria; temperature and pressure dependence of thermodynamic quantities; Le Chatelier principle;

4. Electrochemistry: Nernst equation, redox systems, electrochemical cells: DebyeHuckel theory: electrolytic conductance - Kohlrausch's law and its applications; ionic equilibrium: conduct metric and potentiometric titrations.

5. Chemical kinetics: Empirical rate laws and temperature dependence; complex reactions: steady state approximation; determination of reaction mechanisms; collision and transition state theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; photochemical reactions.

6. Solid state: Crystal structures; Bragg's law and applications; band structure of solids.

7. Polymer chemistry: Molar masses; kinetics of polymerization.

11.6 University School of Humanities & Social Sciences

11.6.1.Additional Eligibility Criteria :

The minimum eligibility for admission shall be a Master's Degree in relevant field or equivalent as stipulated in clause 1 of admission brochure.

11.6.2.Mode of Ph. D. Programme :

Full Time

11.6.3.Syllabus for Entrance Test :

Part – A Research Methodology (English)

	Research Methodology (Subjective/Essay Type Test)	-	50%
a.	Practical Criticism	-	25 %
b.	Literary Theory and its Application	-	25 %

Part – B English (Subject Specific Test)

	MCQ Test	-	50%

a. Indian Literature

b. Indian Literatures in English Translation

c. British Literature

d. American Literature

e. World Literature in English and English Translation.

f. Literary Criticism and Theory.

Scheme of Examination

There will be two essay type questions on research methodology (Part - A above). Both the questions will have internal choice. The candidates shall attempt both the questions.

Subject Specific Test – This component will have Multiple Choice Questions (MCQ) covering the topics mentioned in Part – B above.

Part – A Research Methodology (Sociology)

I. Research Methodology: Qualitative and quantitative research methods, Tools of data collection, Sampling techniques and types, Modern research techniques, Bibliography and references.

Important sociological thinkers and their contributions and theoretical approaches

Part – B Sociology (Subject Specific Test)

II Important salient features of Indian society: Social problems, social stratification, family and marriage in India, kinship structure, religion, rural and urban societies, folk and urban culture, tribal societies, crime in society, political and economic institutions.

Scheme of Examination: There will be objective/multiple choice questions of 100 questions.

11.7 University School of Law & Legal Studies

11.7.1.Additional Eligibility Criteria :

LL.M. 2 years/1 year from an Indian/Foreign University recognized as per clause 1 of admission brochure.

11.7.2.Mode of Ph. D. Programme :

Full Time/Part Time

11.7.3.Syllabus for Entrance Test :

This is a test to evaluate, appraise and assess general understanding and comprehension of the students as to Research and Law. The paper shall consist of 100 multiple choice questions out of which 50% will be from Research methodology (more inclination towards legal research) & 50% from Law which is inclusive of recent trends covering core and main stay areas like Constitutional law, Jurisprudence, Intellectual Property Rights, Corporate law, Criminal law etc.

The syllabus for the test is divided in two parts viz. Part A & Part B as elucidated below:

PART – A – Research Methodology

Part A is designed to assess knowledge of the students in area of Research specifically legal Research

Research Methodology and Legal Research: meaning, types, nature, objectives characteristics, Steps involved, tools and techniques for data collection, data interpretation and processing, qualitative and quantitative research, Ethical issues involved, analysis of current trends in legal research, diminishing ethical standards in legal research, inter disciplinary research etc

PART – B – Law (Subject Specific Test)

Part-B is designed to evaluate and examine subject specific knowledge of the candidate in Law:

1. Constitutional Law of India
(a) Preamble
(b) Fundamental Rights and Duties
(c) Directive Principles of State Policy
(d) Parliament
(e) Judiciary
(f) Emergency Provisions
(g) Amendment of the Constitution
(h) Writ Jurisdiction etc.
2. Jurisprudence
(a) Schools
(b) Sources
(c) Personality
(d) Rights & Duties
(e) Concepts of Possession and Ownership
(f) Principles of Liability etc.
3. Other Areas in Law and Contemporary issues :

(Other areas would include, corporate laws, criminal law, IPR, IT/Cyber Laws, personal laws and legal issues of contemporary importance)

11.8 University School of Mass Communication

11.8.1.Additional Eligibility Criteria :

The minimum eligibility for admission shall be a Master's Degree in relevant field or equivalent.

11.8.2.Mode of Ph. D. Programme :

Full Time

11.8.3.Syllabus for Entrance Test :

Part – A Research Methodology

1. Research: Definition; Sciences and Research; Characteristics of Scientific Method; Facts , Trends , Perspectives & Ideology; Information , Knowledge & Customized Knowledge
2. Mass Communication Research(MCR): Definition and Need; MCR & Scientific Method
3. Types of Research: Pure & Applied; Descriptive, Correlative, Explanatory & Exploratory; Qualitative & Quantitative
4. Approaches to MCR: Social Science Approach & Critical Theory Approach; Critical Theory ; Role of Theory in Research

5. Evolution of MCR-I: Critical Studies (Chicago School & Frankfurt School) ; Early Content Studies (Gate Keeping, Social Influences, Reporting-Sources Relationship)
6. Evolution of MCR-II: Powerful Effects (Magic Bullet), Limited Effects, Moderate Effects(Knowledge Gap, News gathering/News net), Political Effects (Agenda –setting, Spiral of Silence), Individual Effects (Cultivation Research, Dependency Theory), Contingent Effects; Uses & Gratification Research
7. Qualitative Research Methods: Participant Observation, Textual Analysis, In-depth Interviews, Focus-group Discussion, Case Studies, Ethnography , Historical Analysis , Discourse Analysis
8. Quantitative Research Methods: Experiments, Causation, Survey, Content Analysis
9. Variables: Definition; Converting Concepts into Variables; Types (Independent, Dependent, Extraneous, Intervening; Active & Attribute; Categorical , Continuous, Constant, Dichotomous, Polytomous); Types of Measurement Scales(Nominal, Classificatory, Ordinal/Ranking, Interval & Ratio)
10. Sampling: Definition of Population & Samples, Probability & Non-probability Sampling, Sample size & Sample Errors
11. Statistical Tools: Frequency distribution, Cumulative Frequency, Histogram/bar Chart, Frequency Polygon, Frequency Curve, Normal Curve, Skewness; Mean, Median, Mode; Dispersion, Range, Variance, Standard Deviation; Tests of Significance, T-test, ANOVA, Chi-Square test, Z-Test, F-test; SPSS
12. Impact of Technology on Research, Measuring Web Use, Internet research Tools
13. Research Ethics: Theories & Principles; Plagiarism; Intellectual Property Rights

Part – B Mass Communication (Subject Specific Test)

1. Communication & Mass Communication

Process, Models, Theories, Nature, Feature, Types, Terms, Media & Society, Media and development, Media Effect Studies

2. Print Journalism

History of journalism in India and World, Profession, Function in society, Role & Responsibility, Ethics , Media Laws, Careers, Function of various professionals in journalism, Self Regulation, Professional Organisations,, Press Commission, Press Council, RNI, IFWJ, NUJ, INS, PTI, UNI etc. News Agencies of world, ABC, Language Newspapers, Print production- lay out , design, use of software in production. Specialized areas in Journalism

3. Broadcasting

Origin and growth of Radio and Television in world and India, Committees in broadcasting, Prasar Bharti, IBF, NBA, Broadcast Editors Association, SITE, Radio/TV broadcasting and development.

4. Development Communication

Concept, Dominant Paradigms, Alternative theories, Approaches, Development Support Communication, Sustainable Development, Participatory approach. Communication and Development.

5. Integrated Marketing Communication

Advertising and Public Relations. ASCI, PRSI, IPRA, Brand Management, Ad and PR agencies-Organisation, Nature, Function. Account Planning, Copy making, Media Planning, TRP, IRS, BARC, Tools & Technique of PR, Theories applied in Advertising and PR. Advertising &

Society. Gender role in Advertising, Effects of advertising, Advertising and youth, women, children.

6. Radio and Television production

Grammar of TV & Radio, Production team- role and responsibility, Program formats for Radio and Television, Writing for Radio and Television, Camera, Light, Composition, Visual Language, Cues and commands, Sound, Microphone, sets, use of software in radio/ TV production.

7. Cinema

History of Cinema- World and India, Grammar of Cinema, Theories, Process of production, Professions in Cinema.

8. Media organisation and Management

Media Management, Ownership pattern, Organisational structure of Print, broadcast media houses, Cinema and TV production houses, Advertising and PR agencies, Issues in media economics, Ethics, Regulation, Influence of Market, Political, Social forces and impact of national and world economy, mergers and acquisitions,

9. Convergent Media

Online media, Convergence, Writing and designing for new media, blog, vlog, Web newspaper, magazines, radio, video and cinema.

11.9 University School of Information, Communication & Technology

11.9.1.Additional Eligibility Criteria :

S. No.	Ph.D. Discipline	Eligibility Criteria
1.	Computer Science & Engineering	1. M.Tech. (CSE/Computer Systems) or equivalent with 60% marks/7 CGPA 2. Qualified in CET/*GATE in CS & IT/UGC JRF in Computer Application
2.	Information Technology	1. M.Tech. (IT) or equivalent with 60 % marks/7 CGPA 2. Qualified in CET/*GATE/UGC JRF in Computer Science & IT/Computer Application
3.	Computer Application	1. MCA with 60% marks/7 CGPA 2. Qualified in CET/*GATE/UGC JRF in Computer Science & IT/Computer Application
4.	Electronics & Communication	1. M.Tech. in (ECE/VLSI Design/DC/SP/RF & Microwave) or equivalent with 60% marks/7 CGPA 2. Qualified in CET/*GATE in ECE/UGC JRF in Electronic Science
5.	Mechanical & Automation Engineering	1. M.Tech. in Production Engineering/Design Engineering/Thermal Engineering/Tool Engineering/Robotics & Automation Engineering or equivalent with 60% marks/7 CGPA 2. Qualified in CET 3. *GATE in Mechanical Engineering/Production and Industrial Engineering.

* Valid and Qualified GATE score

Note:

1. In case of M.Tech. in (Information Security/Software Engineering/Cyber Security/software systems/Artificial Intelligence) candidate shall be offered discipline in Ph.D programme based on B.Tech. Degree.

2. In case of candidate having M.Tech. (Robotics & Automation Engineering) degree, candidate can qualify GATE examination based on his/her B.Tech. degree discipline.

11.9.2.Mode of Ph. D. Programme :

Full Time/Part Time

11.9.3.Syllabus for Entrance Test :

Part –A -Research Methodology (Common to CSE/IT/CA/ECE/MAE discipline)

Linear Algebra: Matrix algebra, systems of linear equations, eigenvalues and eigenvectors.
Calculus: Functions of single variable, limit, continuity and differentiability, mean value theorems, indeterminate forms; evaluation of definite and improper integrals; double and triple integrals; partial derivatives, total derivative, Taylor series (in one and two variables), maxima and minima, Fourier series; gradient, divergence and curl, vector identities, directional derivatives, line, surface and volume integrals, applications of Gauss, Stokes and Green's theorems.
Differential equations: First order equations (linear and nonlinear); higher order linear differential equations with constant coefficients; Euler-Cauchy equation; initial and boundary value problems; Laplace transforms; solutions of heat, wave and Laplace's equations.
Complex variables: Analytic functions; Cauchy-Riemann equations; Cauchy's integral theorem and integral formula; Taylor and Laurent series.
Probability and Statistics: Definitions of probability, sampling theorems, conditional probability; mean, median, mode and standard deviation; random variables, binomial, Poisson and normal distributions.
Numerical Methods: Numerical solutions of linear and non-linear algebraic equations; integration by trapezoidal and Simpson's rules; single and multi-step methods for differential equations.

Part – B CSE/IT/CA (Subject Specific Test)

Digital Logic Boolean algebra. Combinational and sequential circuits. Minimization. Number representations and computer arithmetic (fixed and floating point).
Computer Organization and Architecture Machine instructions and addressing modes. ALU, data-path and control unit. Instruction pipelining. Memory hierarchy: cache, main memory and secondary storage; I/O interface (interrupt and DMA mode).
Programming and Data Structures Programming in C. Recursion. Arrays, stacks, queues, linked lists, trees, binary search 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 paths.

Theory of Computation Regular expressions and finite automata. Context-free grammars and push-down automata. Regular and contex-free languages, pumping lemma. Turing machines and undecidability.

Compiler Design Lexical analysis, parsing, syntax-directed translation. Runtime environments. Intermediate code generation.

Operating System Processes, threads, inter-process communication, concurrency and synchronization. Deadlock. CPU scheduling. Memory management and virtual memory. File systems.

Databases ER-model. Relational model: relational algebra, tuple calculus, SQL. Integrity constraints, normal forms. File organization, indexing (e.g., B and B+ trees). Transactions and concurrency control.

Computer Networks Concept of layering. LAN technologies (Ethernet). Flow and error control techniques, switching. IPv4/IPv6, routers and routing algorithms (distance vector, link state). TCP/UDP and sockets, congestion control. Application layer protocols (DNS, SMTP, POP, FTP, HTTP). Basics of Wi-Fi. Network security: authentication, basics of public key and private key cryptography, digital signatures and certificates, firewalls.

Part B - Mechanical & Automation Engineering (Subject Specific Test)

Free-body diagrams and equilibrium; trusses and frames; virtual work; kinematics and dynamics of particles and of rigid bodies in plane motion; impulse and momentum (linear and angular) and energy formulations, collisions. 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; 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 S-N diagram; principles of the design of machine elements such as bolted, riveted and welded joints; shafts, gears, rolling and sliding contact bearings, brakes and clutches, springs.

Fluid Mechanics and Thermal Sciences Fluid Mechanics: Fluid properties; fluid statics, manometry, buoyancy, 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. 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, StefanBoltzmann law, Wien's displacement law, black and grey surfaces, view factors, radiation network analysis.
Thermodynamics: Thermodynamic systems and processes; properties of pure substances, behaviour 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.
Materials, Manufacturing and Industrial Engineering 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, design of jigs and fixtures. Metrology and Inspection: Limits, fits and tolerances; linear and angular measurements; comparators; gauge design; interferometry; form and finish measurement; alignment and testing methods; tolerance analysis in manufacturing and assembly. Computer Integrated Manufacturing: Basic concepts of CAD/CAM and their integration tools. Production Planning and Control: Forecasting models, aggregate production planning, scheduling, materials requirement planning. 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.

Part – B - Electronics & Communication Engineering (Subject Specific Test)

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.

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 Circuits 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 opamp 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, multiplexers, decoders 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 systems; Analog communications: amplitude modulation and demodulation, angle modulation and demodulation, spectra of AM and FM, superheterodyne receivers, circuits for analog communications; 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 correction, Hamming codes; Timing and frequency synchronization, inter-symbol interference and its mitigation; Basics of TDMA, FDMA and CDMA.

Electromagnetics Electrostatics; 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.

11.10 University School of Education

11.10.1. Additional Eligibility Criteria:

Candidates holding Master's degree or a degree equivalent to Master's degree in Education, that is, Master of Arts (Education), M.Ed. approved by UGC/NCTE with at least 55% marks in aggregate or its equivalent grade "B" in a point scale wherever grading system is followed . A relaxation of 5% marks, from 55% to 50% or an equivalent relaxation in grade shall be allowed for those belonging to SC/ST/Differently–abled categories.

11.10.2. Mode of Ph. D. Programme :

Full Time/Part Time

11.10.3. Syllabus for Entrance Test :

Part – A Research Methodology

Elementary statistics including mean, medium, mode, SD variance, normal distribution, poisson distribution, exponential distribution, correlation, covariance, Educational Research: Meaning, nature, types, scope, and limitations.

- Tests of Hypothesis
- Data Analysis
- Sampling design
- Research design & procedure
- Quantitative techniques
- Interpretation of data

Part – B Subject Specific Test

- Philosophical and sociological perspective of education
- Advance Educational Psychology
- Methodology of Educational Research
- Curriculum & Evaluation
- Educational Management, Planning & Finance
- Teacher Education in India: Growth and Development
- Educational Technology
- Educational Evaluation
- Environmental Education
- Educational Leadership and management
- Educational and Vocational Guidance
- Education for Special Focused Groups
- Language and Communication Technology in Education
- Social Science Education
- Science Education
- Education for Human Rights, Peace, International Understanding and Value Education


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