INFORMATION & GUIDELINES

FOR

COMBINED RESEARCH ENTRANCE TEST (CRET)–2023

इलाहाबाद विश्वविद्यालय

QUOT RAMI TOT ARBORES

यावत्यः शाखास्तावन्तो वृक्षाः

UNIVERSITY OF ALLAHABAD

(A CENTRAL UNIVERSITY)

PRAVESH BHAWAN, OLD KATRA
PRAYAGRAJ, UTTAR PRADESH -211002

UNIVERSITY OF ALLAHABAD

INFORMATION AND GUIDELINES FOR
COMBINED RESEARCH ENTRANCE TEST (CRET)–2023

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DIRECTOR, CRET-2023	DIRECTOR, ADMISSIONS-2023

Please refer https://aupravesh2023.cbtexam.in/ **or CRET-2023 link of www.allduniv.ac.in for further details**

IMPORTANT NOTE

1. The format of application is ONLINE and the applicant must take due care while filling up the online-form. The information provided by the applicant in his/her form shall not be changed or altered in any case. **The University shall not be liable for any mistake/error committed by the applicant.**
2. **CRET-2023 will be conducted in OFFLINE mode at Prayagraj only**.
3. There is no provision of the re-evaluation/ scrutiny of answer sheets.
4. The applicant can view their answer sheet within **30 Days** from the declaration of Results by paying a token amount Rs.200/- (Online) as a Miscellaneous Fee to the University of Allahabad. The receipt must be submitted to the Pravesh Bhavan along with the request application within the stipulated time.

   No applications shall be entertained which are received after **30 Days** from the date of declaration of the result of CRET-2023.
5. The applicants will have to mention their Social Categories, e.g., UR, SC, ST, OBC and EWS and Sub-Categories, e.g., caste. **The social category mentioned in the application form cannot be changed/modified at any level.**
6. The minimum qualifying marks in CRET-2023 Written Examination shall be 50% for Unreserved (UR) applicants and 45% for EWS, OBC, SC, ST, and Person with Disability (PwD) applicants.
7. Every applicant must declare in the application form if he/she has been penalized by a court of law or if any disciplinary/police action is pending against him/her. Failing which the candidature of the applicant shall be cancelled at any point of time by the competent authority of the University of Allahabad.
8. **The TEST FEE prescribed for Different Categories of applicants for CRET-2023 are as follows:**

   UR/OBC /EWS : ₹1800/-

   SC / ST/PwD : ₹900/-
9. **There shall be NO NEGATIVE marking in CRET-2023.**
10. There will not be any deduction of marks for gap years.

SCHEDULE OF CRET-2023

Start date of Registration and Form Submission ONLINE	**26th October 2023**
Last date of ONLINE Registration	**15th November 2023**
Last date of Fee Deposition and Form Submission ONLINE	**16th November 2023**
Downloading of Admit Cards (ONLINE ONLY)	**A WEEK BEFORE THE DATE OF EXAMINATION**
Date of Entrance Test	**WILL BE ANNOUNCED LATER ON THE UNIVERSITY WEBSITE**

The University of Allahabad shall conduct COMBINED RESEARCH ENTRANCE TEST-2023 (CRET-2023) at Prayagraj for admission to the degree of Doctor of Philosophy (Ph.D.) (here in after referred to as Ph.D. Programme) of the University of Allahabad for the session 2023-24 in the subjects specified in SECTION 2 of this Brochure.

As laid down in the Ordinance LVI of the Second Revised Ordinance of the University of Allahabad (made under Section 29 of the University of Allahabad Act, 2005) candidates for admission to the degree of Ph.D. Programme must hold a Master's degree (or a degree recognized by the University as equivalent thereto) in a relevant subject from the University, or any other University or an Institution recognized by it, and must fulfil other prescribed conditions of eligibility.

Regular teachers of the University of Allahabad and of any institution / Constituent Colleges maintained by it or admitted to its privileges and International Applicants / Officers of Armed Forces are exempted from appearing at CRET Level-1 for admission to Ph.D. Programme. **All other candidates, including JRF,** are required to appear at CRET-2023 Level-1 for admission to the Ph.D. Programme in the concerned subjects.

All the applicants, **including exempted applicants**, shall register and submit their application form through the ONLINE APPLICATION AND REGISTRATION PROCESS and deposit the required FEE in the prescribed manner at the website https://aupravesh2023.cbtexam.in/ or CRET-2023 link available on www.allduniv.ac.in.

Note: The JRF qualified candidates are also required to appear in CRET (Level -1) Test.

The details and instructions in respect of CRET-2023, the procedure applicable to the Regular teachers of the University of Allahabad / Constituent Colleges, Officers of Armed Forces candidates and International Applicants exempted from CRET-2023 (Level–1) and relevant information on the Ph.D. Programme are set out in the following sections of this Bulletin.

SECTION 1: INFORMATION- AT A GLANCE

1.01. All applicants seeking admission to the Ph.D. Programme of the University of Allahabad for the session 2023-24, in the subjects listed in para 2.01 (of Section 2), shall have to qualify in the COMBINED RESEARCH ENTRANCE TEST (CRET-2023) to be conducted by the University of Allahabad at Prayagraj.

1.02. All applicants shall be required to fulfil the following ELIGIBILITY CRITERIA for appearing in CRET-2023 and for admission to the Ph.D. Programme.

1.02.1. The minimum score required, as laid down by UGC, at the Post-Graduate Examination is 55% marks (or the equivalent Letter Grade / Grade Point under the seven-point Letter Grade Scale), in the case of UR candidates and 50% marks (or the equivalent Letter Grade/ Grade Point) in the case of EWS/ OBC/ SC/ ST/ PwD candidates. For the purposes of Criterion 1.02.1, the percentage of marks obtained by the candidate **shall not** be rounded-off to the next higher integer.

Note: A candidate who does not fulfil the aforesaid Criteria 1.02.1 shall not be eligible to appear in CRET-2023.

1.03. The CRET-2023 will be conducted in two Levels: Level-1 *(Written Test)* & Level-2 *(Personal Interview/Presentation)*.

1.03.1. **Level-1** of CRET-2023 Test will consist of two papers.

Paper I will have 50 objective type questions (MCQs) of 2 marks each. As per UGC Regulation 2022, 50% of the questions would be from Research Methodology and 50% will be subject specific i.e., 25 questions from Research Methodology and 25 subject specific questions. There will be no negative marking in this part.

Paper II will have subjective type questions with short, medium, and long type answers. The duration of Paper I and II will be 30 minutes and 120 minutes, respectively. The total marks of Paper I and II will be 100 and 200, respectively. Total marks of both papers will be 300. Both papers will be held in a single meeting. The breakup of Paper I and Paper II is also given in the Table-1.

TABLE -1: THE DETAILS OF QUESTIONS TO BE FRAMED IN LEVEL-1

Paper	Sections	Number of Questions	Marks for each question	Total Marks	Duration
I	-	50 *(MCQs)*	02	100	30 minutes
II	1	10 *(Short answer type)*	12	200	120 minutes
	2	2 *(Medium answer type)*	20		
	3	1 *(Long answer type)*	40		

In Paper-II, all questions shall be from the subject opted/selected by the candidates. The paper II will have 3 sections wherein section 1 will contain 10 short answer type questions of 12 marks each, section 2 will contain 2 medium answer type questions of 20 marks each and section 3 will contain 1 long answer type question of 40 marks in which an internal choice/option will also be provided.

Note: The minimum qualifying marks in CRET Level–1 written examination shall be 50% for unreserved (UR) applicants and 45% for EWS, OBC, SC, ST and Differently Abled (PwD) applicants.

1.03.2 The **Level-2** Test shall entail an interview and may include Presentations, group discussions or other modes of appraisal and shall be administered by the Doctoral Programme Committee of the Department / Institute / Centre concerned.

1.04 **Exemption from Level–1**: The following categories of candidates shall be exempted from the **Level-1** Test for admission to Ph. D.

1.04.1 **Teachers Candidate:** Teachers of the University of Allahabad or its Constituent Colleges who are seeking admission to the Ph.D. programme are exempted from Level -1 and be separately assessed at Level-2. They shall be considered supernumerary and will not be counted for the overall limit of candidates enrolled under the supervisor. Regularly appointed teachers of the University of Allahabad (including Institutes, Independent Centres and Constituent Colleges of the University of Allahabad) desirous of admission to the Ph.D. Programme in their respective subjects should apply Online for the Ph.D. Programme in the manner specified in the proviso to clause 1(c) of the Ordinance LVI (The Doctor of Philosophy Programme) of the Second and Revised Ordinances of the University of Allahabad.

Note I: This exemption is available only to the regular and permanent teachers of the University of Allahabad and its Constituent Colleges.

The exemption mentioned in para 1.04.1 **will not be applicable** to the ward of any serving or retired, part time/full time Teacher/Employee of the University of Allahabad.

Note II: The term Teacher referred in clause 1.04.1 means Assistant Professor/Associate Professor/ Professor duly appointed by the competent authority against substantive post in any Department/Centre/Institute in the University of Allahabad and its constituent colleges.

1.04.2 **Officers of Armed Forces**: Serving Army, Navy and Air Force Officers with not less than 15 years of service and holding the rank of Colonel in the Army, or equivalent rank in the Air Force / Navy, who are applying for Ph.D. in the ***Department of Defence and Strategic Studies*** are exempted from Level-1and be separately assessed at Level-2 against a specified number of vacancies.

1.04.3 **International Candidates**: International Candidates seeking admission to the Ph.D. Programme should contact the International Candidate Advisor of the University, who shall issue appropriate instructions to such Candidates, who fulfil the qualifications for being considered for admission to the Ph.D. Programme. The cases of International Applicants are subject to the provisions of the third proviso to clause 1 (a) (iii) of the Ordinance LVI of the Second and Revised Ordinances of the University of Allahabad. The process and schedule for the admission of International Applicants may be different from that for the candidates qualifying CRET-2023 and the Teachers referred to in para1.04.1.

1.05 **Guidelines for Reservation:** Reservation in Ph.D. Programme shall be implemented, as per MHRD/UGC directions, Government Orders, and guidelines issued from time to time.

1.05.1 There shall be a reservation of 15% seats for the Scheduled Caste (SC), 7.5% for the Scheduled Tribe (ST) and 27% for the Other Backward Class Non-Creamy Layer (OBC) Categories. A horizontal reservation of 5% shall be extended, across the reserved and unreserved categories, for the Person with Disability (PwD) candidates in accordance with the relevant provisions in this regard.

Note (i) If the seats allocated under the ST category remain unfilled, then the remaining seats under ST category will be allocated to the eligible SC category candidates and vice-versa. But if seat(s) remain vacant in SC/ST, the same will not be transferred to any other category for admission in Ph.D. Programme.

(ii) Reservation shall be implemented for SC/ST/OBC/EWS/PwD categories, if the calculation of seats for a given category is ≥0.5.

1.05.2 In accordance with O.M.F.No.12-4/2019-U1 dated 17th January 2019 of the Department of Higher Education, MHRD, Government of India, 10% reservation shall be extended to the candidates belonging to the Economically Weaker Sections (EWS) of the total seats.

1.06 **Minimum qualifying marks**: There shall be category-wise minimum qualifying marks for Level 1 Test, as given in Table 2. A list of eligible candidates for the Level-2 Tests shall be drawn up for only those candidates who manage to secure minimum qualifying marks as mentioned in the Table 2.

TABLE 2: MINIMUM QUALIFYING MARKS AS PER UGC REGULATION, 2022 FOR LEVEL-1

For Unreserved Category Candidates	50% of 300 = 150
For EWS/ OBC/ SC/ ST/ PwD Category Candidates	45% of 300 = 135

Note: Securing qualifying marks does not confirm to qualify of Level-2.

1.07 A candidate who fails to secure the minimum qualifying marks in the respective social categories (i.e., UR, EWS, OBC, SC, ST and PwD) shall stand disqualified.

1.08 A **LIST OF ELIGIBLE CANDIDATES** for the Level-2 Test shall be announced by the CRET-2023 Committee on the basis of the following considerations:

Vacancies in any Department/ Institute/ Centre/ College in any session will depend on the number of approved research supervisors of the Subject/ College/ Centre concerned. The CRET-2023 Committee shall report the number of vacancies as intimated by the respective Head/ Coordinator/ Director/ Principal of the Department/ Centres/ College in the respective subject. The number of candidates *(from amongst those qualifying for Level-2 Test on the basis of the written tests and those exempted from the Level-1 Test)* to be called for the Level-2 Test in the respective subject / unit / centre shall be determined on the basis of the vacancies as intimated by the respective Head of the Department/ Director/ Coordinator/ Principal concerned. Admission to Ph.D. Programme in a unit shall be finalized in the context of the availability of seats (vacancies) under the approved supervisors in the concerned Unit/Department and the Reservation rules. Accordingly, the University reserves the right to determine the admissions to the Ph.D. programme in each unit as per relevant provisions of Second and Revised Ordinances of Allahabad University (Ordinance LVI) and the Reservation Policy.

1.08.1 Against each vacancy at the most two candidates will be declared eligible for Level-2 *(Academic Council Resolution No. 02/19 dated 15th May 2016)*.

1.08.2 In accordance with the UGC Regulation 2022 and Ph.D. Ordinance of the University of Allahabad *(vide letter no. 05/R/539/2019 dated 20th June 2019)*, **70% of weightage will be given to the written examination** and **30% to the Interview**. The final merit shall be prepared by adding marks obtained by a candidate in CRET (Level 1 & 2 combined) and Academic Record of the applicant on the basis of Table 3.

TABLE 3: METHODOLOGY FOR PREPARING MERIT LIST.

Degree	Marks	Academic Performance Score	Maximum
1. High School	Less than 50%	0	**2**
	50% or more, but less than 60%	1	
	60% or more	2	
2. Intermediate	Less than 50%	1	**3**
	50% or more, but less than 60%	2	
	60% or more	3	
3. Undergraduate	Less than 50%	2	**5**
	50% or more, but less than 60%	3	
	60% or more	5	
4. Postgraduate	50% or more, but less than 55%	5	**10**
	55% or more, but less than 60%	7	
	60% or more	10	
5. National Level Test	NET or equivalent	3	**5**
	JRF	5	
6. CRET Test Marks	Total Marks obtained in Entrance Test to be converted in Thirty-five (Level - 1)		**35**
7. Interview	Level -2		**15**
	TOTAL MARKS		**75**

Note: The marks of NET/JRF/equivalent in CRET Level-2 will be considered, provided the date of declaration of result/award of NET/JRF is on or before the last date of CRET-2023 application form.

1.09 All applicants should apply to the Director, CRET-2023, through the **ONLINE APPLICATION AND REGISTRATION PROCESS** from the website **https://aupravesh2023.cbtexam.in/** OR CRET Admission-2023 link of **www.allduniv.ac.in,** in accordance with the instructions set out in **SECTION 3** of this brochure.

1.10 The rules and procedures for admission/registration and matters applicable to the Ph.D. students shall be governed by the Ordinance LVI (The Doctor of Philosophy Programme) of the Second and Revised Ordinances of the University of Allahabad and other relevant Ordinances, Regulations and rules of the University of Allahabad.

1.11 All admissions to the Ph.D. Programme shall initially be on PROVISIONAL basis and the admitted candidates shall be required to attend and attain the minimum requisite standards and shall be required to complete the Pre-Doctoral Programme offered by the respective Department/Unit/Centre.

1.12 The candidate shall be allowed to continue with the Ph.D. Programme/submission only upon the successful completion of the Pre-Doctoral Programme of at least one Semester (six months) duration.

1.13 Under the provisions of clauses 1(b) of the Ordinance LVI of the Second and Revised Ordinances of the University of Allahabad.

1.14 Under the provisions of clause l(c) of the Ordinance LVI of the Second and Revised Ordinances of the University of Allahabad, an employed candidate (other than a teacher referred to in para 1.04.1) shall not be considered for admission to the Ph.D. Programme

except upon submitting a *'No Objection Certificate'* from his/her employer to the effect that the candidate, If posted within the territorial area of the University, shall be permitted to report for research work to the Department/Institute/Centre concerned and to attend course-work and other academic activities there or at other location or if posted outside or transferred from, the said area, shall be granted leave of absence for the requisite period to fulfil the requirement of residence within the area.

1.15 A candidate who takes up employment after joining the Ph.D. Programme shall be required to immediately give information in writing to the effect to the Head/Director/Coordinator of the Department/Institute/Centre where he/she is enrolled, and his/her admission shall be subject to the provisions of clause 1(c) referred to in para 1.14. In case the candidate conceals such information or fails to present the prescribed *'No Objection'* Certificate of the employer for continuing in research, or defaults on any other applicable condition in this regard, he/she shall not be entitled to continue in the Ph.D. Programme and his/her admission to the Ph.D. Programme shall stand terminated.

1.16 No candidate admitted to and enrolled in the Ph.D. Programme shall be entitled to continue in, or accept, any remunerative assignment during the period of enrolment in the Programme, other than a Fellowship/Scholarship/other stipend awarded for pursuing the Programme.

1.17 **The University shall not provide any Scholarship or Financial benefit to the Research Scholar admitted in the Constituent Colleges.** However, the concerned college or any financial agency may provide scholarship or financial benefit to them. This provision shall not apply to the remuneration being drawn by the teachers referred to in para-1.04.1or by the employed candidates referred to in para1.14.

1.18 No candidate admitted to and enrolled in the Ph.D. Programme shall be entitled to continue in or join any other Degree course or any full-time Diploma/Certificate course of the University of Allahabad or of any other University/ Institution. However, he/she may be permitted (or required) to join a part-time or add-on Diploma/ Certificate course, in according with the provisions of Ordinance LVI of the Second and Revised Ordinances of the University of Allahabad and other relevant Ordinances of the University.

1.19 For Academic Session 2023-24, all applicants (except Regular appointed teachers of University of Allahabad / Constituent Colleges / International Applicants / Officers of Armed Forces) have to appear in the CRET-2023 Examination.

1.20 **The revised Annual Fee for Ph.D. Programme shall be applicable for the candidates admitted in the session 2023-24.**

1.21 **Duration of the Programme**

(1) Ph.D. Programme shall be for a minimum duration of three (3) years, including course work, and a maximum duration of six (6) years from the date of admission to the Ph.D. programme.

(2) A maximum of an additional two (2) years can be given through a process of re-registration as per the Statute/Ordinance of the Higher Educational Institution concerned; provided, however, that the total period for completion of a Ph.D. programme should not exceed eight (8) years from the date of admission in the Ph.D. programme.

Provided further that, female Ph.D. scholars and Differently Abled (having more than 40% disability) may be allowed an additional relaxation of two (2) years; however, the total period for completion of a Ph.D. programme in such cases should not exceed ten (10) years from the date of admission in the Ph.D. programme.

(3) Female Ph.D. Scholars may be provided Maternity Leave/Child Care Leave for up to 240 days in the entire duration of the Ph.D. programme

1.22 **Procedure for Admission**

(a) The admission shall be through CRET, the Entrance test Syllabus shall Consist of 50% of research methodology and 50% shall be subject specific for Paper-I of the CRET-2023.

(b) The minimum qualifying marks for unreserved category candidates are 50% in the CRET (Level-1). However, relaxation of 5% marks will be given in the entrance test (CRET Level-1) for the candidates belonging to EWS / OBC / SC / ST differently abled category.

(c) The selection of candidates for CRET-2023 will be based on the weightage of 70% marks from the entrance test CRET (Level-I) and 30% marks for performance in the interview / viva-voce CRET (Level-II).

1.23 Faculty members with less than three years of service before superannuation **shall not** be allowed to take new research scholars under their supervision. However, such faculty members can continue to supervise Ph.D. Scholars who are already registered until Superannuation and as a Co-supervisor after superannuation.

1.24 Each Supervisor can guide up to two International Research Scholars on a Supernumerary basis over and above the permitted number of Ph.D. Scholars as mentioned in the Ordinance, University of Allahabad.

SECTION 2: SUBJECTS & ELIGIBILITY CRITERIA

2.01 CRET-2023 shall be conducted in the **Subjects** mentioned in the Table-4.

TABLE-4: SUBJECTS AND SEATS AVAILABLE FOR CRET-2023

S. No.	SUBJECT	AU	CMP	ADC	ISDC	SPM	SSK	AKDC	HDC	JT	RTMM	ECC	TOTAL
1.	Agricultural Botany	**2**	-	-	-	-	-	-	-	-	-	-	**2**
2.	Agricultural Chemistry	**2**	-	-	-	-	-	-	-	-	-	-	**2**
3.	Ancient History, Culture & Archaeology	**40**	19	-	4	-	5	-	-	-	-	-	**68**
4.	Anthropology	**3**	-	-	-	-	-	-	-	-	-	-	**3**
5.	Arabic	**1**	-	-	-	-	-	-	-	-	-	-	**1**
6.	Atmospheric & Ocean Sciences	**2**	-	-	-	-	-	-	-	-	-	-	**2**
7.	Behavioural & Cognitive Sciences	**8**	-	-	-	-	-	-	-	-	-	-	**8**
8.	Biochemistry	**10**	-	-	-	-	-	-	-	-	-	-	**10**
9.	Bioinformatics	**3**	-	-	-	-	-	-	-	-	-	-	**3**
10.	Biotechnology	**5**	-	-	-	-	-	-	-	-	-	-	**5**
11.	Botany	**36**	20	-	-	-	6	-	-	-	-	4	**66**
12.	Chemistry	**62**	28	-	-	6	6	-	-	-	-	12	**114**
13.	Commerce & Business Administration	**5**	3	6	6	0	-	-	-	-	-	-	**20**
14.	Computer Science	**14**	-	-	-	-	-	-	-	-	-	-	**14**
15.	Defence & Strategic Studies*	**5**			2								**7**
16.	Design & Innovation in Rural Technology	**6**	-	-	-	-	-	-	-	-	-	-	**6**
17.	Development Studies	**6**	-	-	-	-	-	-	-	-	-	-	**6**
18.	Earth & Planetary Sciences *(Geology/ Geophysics)*	**11**	-	-	-	-	-	-	-	-	-	-	**11**
19.	Economics	**21**	6	2	-	-	-	-	-	4	-	2	**35**
20.	Education	**28**	10	4	2	-	8	6	-	-	-	1	**59**
21.	Electronics & Communication	**31**	-	-	-	-	-	-	-	-	-	-	**31**
22.	English	**57**	13		1		8	2	2			4	**87**
23.	Environmental Science	**8**	-	-	-	-	-	-	-	-	-	-	**8**
24.	Experimental Mineralogy & Petrology	**4**	-	-	-	-	-	-	-	-	-	-	**4**
25.	Food & Nutrition/ Extension Education/ Human Development	**5**	-	-	-	-	-	-	-	-	-	-	**5**
26.	Food Technology	**6**	-	-	-	-	-	-	-	-	-	-	**6**
27.	French	**2**	-	-	-	-	-	-	-	-	-	-	**2**
28.	Gandhi and Peace Studies	**4**	-	-	-	-	-	-	-	-	-	-	**4**
29.	Geography	**30**	1	2	-	4	-	-	-	4	-	4	**45**
30.	German	**2**	-	-	-	-	-	-	-	-	-	-	**2**
31.	Hindi	**20**	21	0	2	8	4	4	-	8	-	-	**67**

S. No.	SUBJECT	AU	CMP	ADC	ISDC	SPM	SSK	AKDC	HDC	JT	RTMM	ECC	TOTAL
32.	Law	**18**	6	-	-	-	-	-	-	-	-	-	**24**
33.	Materials Science	**9**	-	-	-	-	-	-	-	-	-	-	**9**
34.	Mathematics	**15**	14	-	-	-	-	-	-	-	-	-	**29**
35.	Medieval & Modern History	**0**	6		2		4						**12**
36.	Music & Performing Arts	**17**	-	-	-	-	-	6	-	-	-	-	**23**
37.	Painting & Visual Arts	**8**	-	-	-	-	-	-	-	-	-	-	**8**
38.	Persian	**0**	-	-	-	-	-	-	-	-	-	-	**0**
39.	Philosophy	**2**			6							0	**8**
40.	Physical Education	**4**	-	-	-	-	-	-	-	-	-	-	**4**
41.	Physics	**51**	-	-	-	-	-	-	-	-	-	12	**63**
42.	Political Science	**40**	4	2	3	2	-	2	-	-	2	2	**57**
43.	Psychology	**21**	6	2	4	-	-	-	-	-	-	-	**33**
44.	Russian	**2**	-	-	-	-	-	-	-	-	-	-	**2**
45.	Sanskrit	**43**	9		4					1			**57**
46.	Sociology	**10**	10	-	2	-	7	6	-	-	-	-	**35**
47.	Statistics	**10**	-	-	-	-	-	-	-	-	-	-	**10**
48.	Textiles & Apparel Designing	**0**	-	-	-	-	-	-	-	-	-	-	**0**
49.	Theatre & Film	**2**	-	-	-	-	-	-	-	-	-	-	**2**
50.	Urdu	**0**	-	-	-	-	-	-	4	-	-	-	**4**
51.	Zoology	**42**	19	-	-	-	4	-	-	-	-	-	**65**
Total		**733**	**195**	**18**	**38**	**20**	**52**	**26**	**6**	**17**	**2**	**41**	**1148**

*****Seats are reserved for armed forces in Supernumerary Category.

Abbreviations used in above table are- AU: University of Allahabad main campus; **CMP:** Chowdhary Mahadev Prasad Degree College; **ADC:** Allahabad Degree College; **ISDC:** Ishwar Saran Degree College; **JT:** Jagat Taran Girls Degree College; **SSK:** Sadanlal Sanwaldas Khanna Girls Degree College; **AK:** Arya Kanya Degree College; **SPM:** Shyama Prasad Mukherjee Government Degree College, **ECC:** Ewing Christian College; **RTMM**: Rajarshi Tandon Mahila Mahavidyalaya; **HDC**: Hamidia Girls Degree College

NOTE:

i. **Number of seats may vary in different Departments as per availability of Supervisor and as per the decision of the competent authority of the University of Allahabad.**

ii. **Teacher candidate of the University of Allahabad or its Constituent Colleges/ Officers of Armed Forces / International Applicants must apply through Online Form. However, Teacher Candidates/ Officers of Armed Forces/ International Applicants are exempted for CRET Level-I test.**

2.02 The University reserves the right to withdraw any of the subjects specified in para 2.01 from CRET-2023 without assigning any reason. The vacancies in any subject of Ph.D. may increase/decrease at the time of declaration of result. The University reserves the right to not allow admission for Ph.D. in any subject in the Constituent Colleges/Departments/Centres of the University.

2.03 An applicant is entitled to appear for the Level-1 Test of CRET-2023 in **ONLY ONE SUBJECT,** as per para 2.01. If any subject(s) is not included in the given list (Table 4), the candidate may refer to Table-5 for conforming to the eligibility criteria.

TABLE-5: ELIGIBILITY CRITERIA FOR CRET-2023

S. NO	SUBJECT	PROGRAMME SPECIFIC ELIGIBILITY CRITERIA
1.	Agricultural Botany	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Agricultural Botany
2.	Agricultural Chemistry	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Agricultural Chemistry/ Soil Science
3.	Ancient History, Culture & Archaeology	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Ancient History/ Archaeology
4.	Anthropology	M.Sc./M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Anthropology
5.	Arabic	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Arabic/ Persian or a related field
6.	Atmospheric & Ocean Sciences	M.Sc./M.S./M.Tech. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Atmospheric/ Ocean Sciences/ Earth System Science/ Atmospheric and Ocean Meteorology/ Earth Science/ Geo physics/ Geology/ Environmental Science/ Physics/ Mathematics/ Statistics/ Computer Science/ Data Science/ Information Technology/ Civil Engineering/ Mechanical Engineering/ Agriculture Engineering/ Ocean Engineering
7.	Behavioural & Cognitive Sciences	M.Sc./M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Cognitive Sciences or cognate disciplines like Neuroscience/ Life sciences/ Zoology/ Computer science/ Psychology/ Philosophy/ Linguistics
8.	Biochemistry	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Biochemistry
9.	Bioinformatics	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Bioinformatics
10.	Biotechnology	M.Sc./M.Tech. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Biotechnology
11.	Botany	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Botany
12.	Chemistry	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Chemistry
13.	Commerce & Business Administration	M.Com./M.B.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Commerce and Business Administration
14.	Computer Science	M.Sc./M.Tech. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Computer Science/ Computer Technology
15.	Defence & Strategic Studies	M.Sc./M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Defence & Strategic Studies
16.	Design & Innovation in Rural Technology	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Rural Technology and Development/ Botany, Microbiology/ Agriculture Botany/ Fisheries
17.	Development Studies	M.A./M.Sc./M.Com. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Development Studies/ Political Science/ Sociology/ Economics/ Geography/ Education / History/ Philosophy/ Anthropology/ Commerce and Management/ Environmental Science/ Women's Studies/ Media Studies/ Gandhian Studies
18.	Earth & Planetary Sciences *(Geology/Geophysics)*	M.Sc./M.Sc. (Tech.)/M.Tech. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Geology/ Geophysics/ Applied Geology/ Applied Geophysics/ Earth Science/ Geological Sciences
19.	Economics	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Economics
20.	Education	M.Ed./M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Education
21.	Electronics & Communication	M.Sc./M.Tech. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Electronics/ Communication
22.	English	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in English
23.	Environmental Science	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in any Science Subject
24.	Experimental Mineralogy & Petrology	M.Sc./M.Sc. (Tech.)/M.Tech./Integrated M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Geology/ Geophysics/ Applied Geology/ Applied Geophysics/ Earth Science/ Earth and Planetary Sciences/ Geological Sciences
25.	Food & Nutrition/ Extension Education/ Human Development	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Food & Nutrition/ Extension Education/ Human Development
26.	Food Technology	M.Sc./M.Tech./M.Voc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Food Technology/ Food Science/ Food Process Engineering/ Post-harvest Engineering & Technology/ Food Biotechnology/ Food Microbiology/ Food Processing Technology/ Food Safety & Quality

S. NO	SUBJECT	PROGRAMME SPECIFIC ELIGIBILITY CRITERIA
27.	French	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in French
28.	Gandhi and Peace Studies	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in History, Sociology, Political Science,Philosophy, International Relations, Gandhian Studies, Peace Studies,History/ Sociology/ Political Science/ Philosophy/ International Relations/ Gandhian Studies/ Peace Studies/ Education/ Psychology/ Economics
29.	Geography	M.Sc./M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Geography
30.	German	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in German
31.	Hindi	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Hindi
32.	Law	LL.M. (Post Graduation Degree) with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Law
33.	Materials Science	M.Sc./M.Tech. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Materials Science/Physics/Chemistry/Electronics/Nano-Science/Nano-Technology/Applied Physics/Applied Chemistry/Metallurgy/Solid state Physics/Environmental Science/ Industrial Chemistry
34.	Mathematics	M.Sc./M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Mathematics
35.	Medieval & Modern History	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in History with specialization in Medieval/Modern History
36.	Music & Performing Arts	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Music and Performing Arts
37.	Painting & Visual Arts	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Painting/Visual Arts
38.	Persian	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Persian
39.	Philosophy	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Philosophy
40.	Physical Education	M.P.Ed. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Physical Education
41.	Physics	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Physics
42.	Political Science	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Political Science
43.	Psychology	M.Sc./M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Psychology
44.	Russian	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Russian
45.	Sanskrit	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Sanskrit
46.	Sociology	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Sociology
47.	Statistics	M.Sc./M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Statistics
48.	Textiles & Apparel Designing	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Textiles and Apparel Designing
49.	Theatre & Film	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Theatre & Film/ Mass communication and Journalism
50.	Urdu	M.A. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Urdu
51.	Zoology	M.Sc. or Post Graduation Degree with 55% marks for General Category or 50% marks for EWS/OBC/SC/ST/PwD Categories in Zoology

Note:

i. The candidate is advised to satisfy himself/herself of the eligibility and of the subject of his/her Post-graduation for the purposes of appearing with a particular Subject at CRET-2023.

ii. The subject of eligibility of a candidate appearing for CRET-2023 pertaining to his/her post-graduate examination, in case of any ambiguity shall be referred to the Doctoral Programme Committee (DPC) of the concerned department to arrive at a decision that is binding upon the candidate.

2.04 A candidate appearing at the CRET-2023 Level-2 Test and desirous of persuing his/her doctoral programme in an inter-disciplinary domain, he/she shall be required to obtain **"No-Objection Certificate"** from the respective Departments/ Centres/ Units or an Institutes of the University of Allahabad for his/her Ph.D. Admission.

2.04.1 In case of inter-disciplinary research work, if required, a co-supervisor from outside the Department/ Centre/ Institute/ College/ University may be appointed.

Note: No faculty member shall act as co-supervisor of more than two candidates at one time, and not more than one candidate shall be assigned to a co-supervisor in one academic year.

2.05 At any point, the total number of Ph.D. scholars under a faculty member, either as a supervisor or co-supervisor, **shall not** exceed the number prescribed in the Ordinance, University of Allahabad.

2.06. Before applying for CRET-2023 and appearing at any level, thereof, candidate must satisfy himself/herself that he/she fulfils the prescribed minimum eligibility criteria for admission to the Ph.D. Programme of the University of Allahabad, as specified in para 1.02, and that the subject opted by the candidate is appropriate to him/her, vide para 2.03 (Table-5), or is approved for purposes of admission to the Ph.D. programme in the inter-disciplinary area as opted by the candidate (vide para 2.04).

2.07 If a candidate fails to mention, in his/her On-line Application Form, the subject in which he/she wants to appear for CRET-2023 or indicates in the said Form a subject not specified in para 2.01, or not admissible to him/her under para 2.03, the Application Form shall be liable to be rejected. Where a candidate appears in CRET-2023 (at any Level) in a subject that is not admissible to him/her, his candidature shall be rejected.

2.08 The details entered by the applicant in the form will be verified at Level 2. If it is found at any stage that a candidate has appeared in CRET-2023 (at any Level) in a subject that is not admissible to him/her in terms of para 2.03, his candidature shall be rejected and he shall not be entitled to claim any relief or other concession in that regard.

2.09 At any stage of the admission process, the University of Allahabad reserves the right to cancel the candidature if the application is not meeting the requisite criteria.

SECTION 3: APPLICATION, REGISTRATION PROCESS & SCHEDULE

3.01. An applicant who fulfils the minimum Eligibility Criteria (vide para 1.02), and seeks to appear in CRET-2023 in a Subject that is available and is also admissible to him/her (vide paras 2.01 and 2.03), must complete, and submit the form online, as per modality and schedule set out in the following paras, the prescribed ON-LINE APPLICATION / REGISTRATION FORM for appearing for the Level 1 (Paper 1 and Paper 2) and Level 2 Test (as the case may be) at CRET-2023 in the concerned / admissible Subject (vide para 2.01), and must remit, within due time, the prescribed Test Fees to the University of Allahabad.

3.02 The Online Application/Registration Form for CRET-2023 shall be accessible only during the dates specified in the Schedule at https://aupravesh2023.cbtexam.in/ OR CRET Admission-2023 link of www.allduniv.ac.in

The applicant must **fill** and **submit** the form **ONLINE**, in accordance with the instructions given in the said **website** and also summarized in this Section.

3.03 Before proceeding to fill and submit the On-line Application/Registration Form for CRET-2023, the applicant is strongly advised to carry out the following tasks for his/her own convenience:

3.03.1 The applicants must read this Bulletin (Information and Guidelines) carefully.

3.03.2 The applicants must go through the CRET-2023 Syllabus of the Subject in which he / she desires, and is eligible, to appear.

3.03.3 The applicant must read the Instructions thoroughly for the filling and submission of the Online Form.

3.03.4. The applicant must review and ensure the correctness of the details of his/her academic record at the High School and Intermediate (or equivalent) and the Graduation and Post graduation level, for purposes of making required entries in the On-line Form.

3.03.5 The applicant must get his/her latest good quality Passport-size Colour Photograph and the signature scanned, so that the scanned Photograph hand Signature can be submitted with the On-line Form. The original of the scanned Photograph should be carefully preserved for submission to the CRET-2023 Committee.

3.03.6 Though it is not mandatory, it is advised that if the candidate does not already have an e-mail address (or e-mail ID), he/she should create for himself/herself a valid email address, in order that the CRET-2023 Committee may send him/her significant instructions or information (as per need) by e-mail.

3.04 As pointed out in para 2.03, the candidate is entitled to appear in only one Subject at CRET-2023. The candidate is also prohibited from "submitting more than one" On-line Application / Registration Form for CRET-2023.

3.05 In case the candidate submits more than one On-line Form, all the Forms submitted by him/her shall stand cancelled.

It should be noted that the Test Fees shall not be refunded or carried over in case the application of the candidate is rejected, or his/her candidature is cancelled at any stage, or he/she does not appear wholly or partially for CRET-2023.

Note: **There is no provision for the withdrawal of candidature for CRET-2023 once the candidate has submitted the Application Form or, pursuant to the same, remitted the Test Fees.**

SECTION 4: GENERAL INSTRUCTIONS

4.0 The University reserves the right to declare the number of eligible candidates in each subject in accordance with the relevant Ordinances and the existing reservation policy of the University. However, admission to Ph.D. Programme will be finalized on the basis of the availability of seats and supervisors in the concerned Department/Centre/Institute.

4.01 The list of eligible candidates for Level-2 (Interview) by the concerned DPC shall be sent to the concerned Department/Centre/Institute. The CRET (Level-I) qualified candidates shall contact the concerned Department/Centre/Institute for further instructions and final selection for admission to its Ph.D. Programme.

4.02 The candidate may inspect their answer sheets for a token payment of Rs.200/- within 30 Days from declaration of the result.

4.03 For the purpose of application of reservation in the university/constituent colleges, the department of university/constituent colleges are to be treated as a separate unit and like university, seats for research admissions are to be calculated college wise and department wise.

4.04 The admission in the university/college shall be in accordance with the Ph.D. ordinance of the University of Allahabad and UGC (Minimum Standard and Procedure for the Award of Ph.D. Degree Regulations, 2022).

4.05 Documents (in original) required at the time of admission:

i. Marksheets and Degree Certificates of the **Qualifying Examination** and all other previous examinations such as High School, Intermediate, Graduation, Post-graduation.

ii. Matriculation or its equivalent certificate to ascertain the date of birth.

iii. GATE/ NET/ JRF or equivalent certificate(s).

iv. Caste/ Category Certificate issued by the appropriate authority if admission is sought under SC/ST/OBC/EWS Category.

v. Medical Certificate issued by the appropriate authority if admission is sought under PwD Category.

vi. Character Certificate issued by the institution last attended.

vii. Transfer Certificate and/or Migration Certificate issued by the institution last attended.

NOTE: If a candidate is unable to produce Transfer Certificate/Migration Certificate at the time of admission, he/she may be provisionally allowed for the admission, subject to submission of required certificates in original within a period of Twenty-One days.

SECTION 5: GUIDELINES FOR ENTRANCE TEST

5.01 Every applicant MUST CARRY THEIR ADMIT CARD for being permitted to appear at the concerned test(s) of CRET-2023.

5.02 Every applicant must sit on their seat as per the roll number allotted.

5.03 No applicant shall be allowed to enter the Examination Hall after 30 minutes of the commencement of the Test.

5.04 No applicant will be allowed to leave the Examination Hall till the end of the Test.

5.05 Calculators/Mobile Phones/Pagers/Smart Watches, etc. shall not be allowed within the premises of the examination centre.

5.06 All candidates are required to retain the admit cards after the test for presenting it at the time of Level-2 (Interview) before the concerned DPC and final admission to the Ph.D., programme of the University.

HELP DESK

Email : aupraveshhelpdesk2023@gmail.com
Helpdesk Number : 9453819486

Note: Call Centre Timing: 10:00 AM to 07:00 PM *(All Days)*

SECTION 6: SYLLABUS *(ANNEXURE-I)*

1. DEPARTMENT OF BOTANY *(AGRICULTURAL BOTANY)*

Established in 1923, the Department of Botany stands as one of the country's oldest university botany departments. Renowned for its interdisciplinary approach, it has garnered international acclaim for its teaching and research standards. The department's distinguished alumni hold prestigious positions worldwide. It has been recognized by the UGC under the Special Assistance and COSIST Support Programs. Offering post-graduate education in Botany and Agricultural Botany with 10 specializations, it also introduced Environmental Science at the post-graduate level. Undergraduate programs are aligned with B.Sc. and B.Sc. (Applied Science) under the Faculty of Science, continually updated to maintain academic excellence. Research focuses on various aspects of Botany.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Applied fields of Agicultural Botany.

🕮 SYLLABUS FOR CRET LEVEL-1 IN AGRICULTURAL BOTANY

- **Horticulture, Fruit and Seed Development, Agroecology and Weeds:**

Importance, present position and scope Horticulture with reference to production, productivity and marketing both in India and abroad, production and marketing problems and remedial measures, Origin, history, breeding and production technology of important fruits, vegetables, flowers, etc; History of gardening in India, their principles and practices with special reference to Mughal, Japanese, and English gardens;

Seed characteristics and variability-Apomixis, parthenocarpy, polydembryony, and somatic embryos; Seed dormancy-types, causes, mechanisms in induction, and release; Seed production and certification-Variety testing, release, and notification, Seed production agencies; Breeder's/nuclear seed, foundation seed, seed certification, and testing; Male sterility, self-incompatibility, and their role in hybrid seed production; Principles of seed processing, seed drying principles and methods; Factors affecting seed storage and role of moisture, temperature, RH, and moisture equilibrium, Storage structures; Externally and internally seed-borne pathogens, mode of infection, development, and spread; Methods of detection of seed-borne diseases.

Concept of crop ecology and its scope in agronomic pursuits; Temperature effects on plants, length of growing season, thermal and physiological growing season, Effects of low temperature, chilling and freezing of plants, Plant characteristics associated with drought and cold resistance; Environmental pollution, global environment change, biodiversity status, biodiversity management approaches; Problems relating to the production of major crops; Phosphorus deficiency and soil fertility, Fixation of nutrients in soil, Soil potassium in relation to soil fertility and plants growth and development, Soil microorganisms and their role in production, Principles and practices of dry farming. Characteristics and classification of weeds; Harmful effects and usefulness of weeds; Botany of important weeds associated

with the crop plants of the region; Methods of preventing the introduction and spread of weeds, principles and procedure of weed control; problems of pesticidal residue in soil; Integrated weed management - principles and applications.

- **Microbiology and Plant Pathology:**

Molecular mechanism of pathogenesis: recognition phenomenon, penetration, invasion, primary disease resistance; Phytoalexins, PR proteins, Antiviral proteins, SAR, SIR and HR, and active oxygen radicals, Tissue culture, Somaclonal variations, and somatic hybridization; Elementary genetic engineering, Management of pathogens through satellite, antisense-RNA, Ribozymes, coat protein, hypovirulence, cross-protection, useful genes, and promoter technology, biosafety, and bioethics.

Identification and classification of bacteria: morphology, ultrastructure, and chemical composition of prokaryotic cell in relation to function, Growth curve, nutrition, and auxotrophic mutants, Resting cell in prokaryotes, elementary bacterial genetics, and variability, transformation, conjugation, transduction. Bacteriophages - lytic and lysogenic cycle, Economic uses of prokaryotes, Morphology, Biochemical characteristics, reproduction, and lifecycle of phytoplasma.

Nature, composition, and architecture of viruses and viroids: Property of viruses, variability in viruses, Satellite viruses and satellite RNA, Assay of plant viruses including biological, physical, chemical, serological, and molecular methods. Histopathological changes induced by viruses in plants, Transmission of viruses: virus–vector relationship; Nomenclature and classification of viruses.

Concept of epidemiology, Development of disease in plant population: Monocyclic and Polycyclic pathogen, Role of environment and meteorological factor in the development of plant disease epidemic, Survey, surveillance, prediction, and forecasting of disease, Phanerogamic parasite, and nonparasitic diseases, Diseases caused by phanerogamic parasite and their management, Disease due to unfavorable soil environment, drought, and flooding stress, etc. Nutritional deficiencies, Primary/Secondary air pollutants, and acid rain, Etiology, disease cycle, perpetuation epidemiology, and management, Post-harvest disease in transit and storage, Aflatoxins and their integrated management.

General principle of plant quarantine: Exotic pathogens and pathogens introduced in India, Sanitary and phytosanitary issues under WTO, TRIPS, and PRA, Genetic basis of disease resistance and pathogenicity - gene-for-gene hypothesis, breeding for disease resistance; production of disease-free seeds and planting materials; chemical nature and classification of fungicides and antibiotics, their bioassay, and compatibility with other agricultural chemicals, resistant to fungicides/antibiotics, effect on environment, Root exudates and rhizosphere effects, Soil microorganisms: major groups, decomposition of organic matter, soil health, Microbial biomass, Manipulation of rhizosphere microflora in plant productivity, Important cultural practices and their role in disease management, solarization, integrated disease management; microorganisms antagonistic to plant pathogens in soil, rhizosphere, and phyllosphere and their uses in the control of plant diseases, soil fungistasis; plant growth-promoting rhizobacteria.

- **Cytogenetics and Plant Breeding:**

Cell Membrane Structure and Functions; Basic Concept and Organization: Chromosome Structure, Nucleosome, Solenoid Nucleolus, Euchromatin and Heterochromatin, Special Type of Chromosomes - Polytene Chromosomes, Lampbrush Chromosomes, B Chromosomes; Gene Concept; Allele Concept, Multiple Alleles, Isoalleles, Pseudoalleles, Cell Division.

Inheritance Genetics: Principles of Mendelian Inheritance and Interaction of Genes, Cytoplasmic Inheritance Involving Chloroplast and Mitochondria, Mitochondrial and Chloroplast Genomes, Interaction Between Nuclear and Cytoplasmic Genes, Sex Determination in Plants.

Cytogenetics and Induced Variations: Linkage and Recombination: Concept of Linkage, Evolution of Linkage Concept, Cis and Trans Arrangement of Linked Genes, Kinds of Linkage, Germinal and Somatic Crossing Over, Detection of Crossing Over, Kinds of Crossing Over.

Spontaneous and Induced Mutations, Point Mutation, Transitions, Transversions, Physical and Chemical Mutagens, Molecular Basis of Mutations; Numerical Alterations in Chromosomes: Euploidy, Polyploidy, Aneuploidy, Autopolyploidy, Allopolyploidy and Their Significance, Induction of Trisomics and Monosomics; Structural Changes in Chromosomes: Deficiency, Duplication, Inversion, Translocation Heterozygotes; Plant Breeding: Breeding Systems, Methods, Selection in Self and Cross-Pollinated Crops, Male Sterility, Self-Incompatibility, Heterosis and Hybrid Vigor.

Frequency Distribution, Measures of Central Tendency, Probability Theory and Its Applications in Genetics. Probability Distribution and Tests of Significance, Correlation, Linear, Partial and Multiple

Regression, Genetic Divergence, Multivariate Analysis, Design of Experiments - Basic Principles, Completely Randomized Design, Randomized Block Design and Split-Plot Design, Complete and Incomplete Block Designs, Data Collection and Interpretation.

- **Crop Physiology, Soil and Water Management:**

Water in Plant Physiology: Water in Plant Cells, Mechanism of Water Uptake by Roots, Transport in Roots, Movement of Water in Plants, Water Loss from Plants, Mechanism of Stomatal Movement, Anti-Transpirants, Physiology of Water under High Temperature and Salinity Stress in Plants, Influence of Water Stresses at Various Levels - Cell, Organ, Plant, Canopy; Indices for Assessment of Drought Resistance; Ion Uptake and Transport - Mechanism and Concepts of Ion Uptake, Short-Distance Transport Pathway from External Solution (Apoplasm) to Sieve Elements Across Root Cortical Cells, Factors Contributing to Xylem Loading, Long-Distance Transport in Xylem and Phloem, Xylem Unloading in Leaf Cells, Uptake and Release of Mineral Nutrients by Foliage; Rhizosphere and Root Biology - Root Growth, Influence of Microorganisms in Nutrient Acquisition, Release and Uptake of Nutrients by Plant Roots, Yield and Mineral Nutrition, Concept of Nutrient Use Efficiency, Mineral Nutrition under Adverse Soil Conditions like Drought, Salinity, Acidity, Heavy-Metal Toxicity (Concept of Phytoremediation); Interaction of Phytohormones and Nutrients - Molecular Aspects of Nutrient Uptake and Transport, Role of Transporter Genes, Genetics of Nutrient Uptake, Identification and Transfer of Genes for Tolerance to Nutrient Deficiencies.

Photosynthesis, translocation, and respiration as key processes regulating carbon metabolism and plant growth; Photosynthesis and bioproductivity; Synthesis of sucrose, starch, oligo and polysaccharides; Translocation of photosynthates and its importance in sink growth; Mitochondrial respiration, growth and maintenance respiration, cyanide-resistant respiration and its significance. Nitrogen metabolism; Inorganic nitrogen species (N_2, NO_3, NH_3) and their reduction, protein synthesis, and nucleic acids; Role of crop physiology in agriculture, crop growth, and productivity, crop growth, Biomass and yield relations; Assimilate partitioning, yield and yield structure analysis; Concept of source and sink; Abiotic stresses affecting plant productivity; Basic principles of a crop improvement program under stress, interactions between biotic and abiotic stresses; Physiological processes affected by drought; Drought resistance mechanisms; Oxidative stress: reactive oxygen species; role of scavenging system (SOD, Catalase, etc.); High-temperature stress; tolerance mechanism, function of HSPs; Chilling stress; effects on physiological processes; Crucial role of membrane lipids; Salinity variation in salt tolerance; Salinity effects at cellular and whole-plant level, tolerance mechanism; Breeding for salt resistance; Heavy metal stress: aluminum and cadmium toxicity in acid soils; Role of phytochelatins (heavy metal binding protein).

2. DEPARTMENT OF CHEMISTRY *(AGRICULTURE CHEMISTRY)*

The Department of Chemistry, specializing in agricultural chemistry, holds a prestigious position within the University of Allahabad, dating back to its establishment in 1872 under the guidance of Prof. Harrison and Prof. Hill. Since its official establishment in 1921, the department has been enriched by a succession of eminent chemists. Offering a diverse range of research opportunities, it has received substantial grants from U.G.C, participating in special assistance and COSIST programs. Moreover, numerous research projects have been sponsored by various funding agencies. The department also offers a two-year M. Sc. course in agricultural chemistry and soil science at the Sheila Dhar Institute of Soil Science, continuously striving for excellence.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Soil Pollution, Phytoremediation of Pollutants, Integrated Nutrient Management, Soil Quality, and Soil Health

🕮 SYLLABUS FOR CRET LEVEL-1 IN AGRICULTURE CHEMISTRY

- **Elements in soil and plants:**

Periodic Classification of elements: electronic configuration, Valency; Oxidation and reduction; ionic equations; essential plant elements (nutrients), Feeredical; lsotopes Chemistry of important compounds and elements essential for plants and Code-02 Animals viz., N, P, K., Mg, Na, Fe, Al, Mo, Cu, Zn, B, I, C, Vr, As, Cr, Ni, Co, Cd, Hg, P, S, Se. The chemistry of silicates, clay minerals etc. Complex compounds, uses of complexants in agriculture.

- **Elements used as fertilizers:**

Macro- Nutrients: and production and consumption of fertilizers; fertilizer industry in India. Chemistry and technology of NPK fertilizers, detailed account of individual NPK fertilizers; Soil amendments, and Methods of fertilizer applications. Mixed fertilizers; new trends in fertilizer use Macro-Nutrients; Cu, Zn, Mn, Fe, B and Mo used as fertilizers Their action in soils.

Theoretical aspects of analytical chemistry: A general information about electrolytic dissociation, solubility product, common ion effect, activity coefficient and pH.

Principles of volumetric analysis, acid base, titration, redox potential and precipitation

Complexometric titrations adsorption indicators. Accuracy and precision in quantitative a analysis. General principles of gravimetric analysis Chromatography. Instrumental methods, methods of analysis Principles involved in colorimetry, flame photometry, turbiditimetry, and X-ray diffraction techniques.

Conductometric and potentiometric methods of analysis.

Electron Microscopy and infra-redspectroscopy, Radio-tracer technique principle, methodology, labeling and assay ofisotopes. Application of physical chemistry of soils

- **Theory of dilute solutions:**

Osmosis, Colloidal State, soil as a colloid. Properties of colloids, colloicalbehaviour of proteins, milk and zeolites. Adsorption as a surface phenomenon. Various equations of adsorption. Fixation of nutrients on soil and clay mineral surface, Law of mass action, chemical affinity and chemical equilibrium. Elements of crystal structure. Redox-process, redox processes in soils.

Soil physical properties, Mechanical composition of soils, Stoke's law Methods of mechanical analysis. Relationship between mechanical analysis and physical properties ofsoil.

Soil water, forms of soil water, methods of measuring moisture, soil water plant relationships. Availability of moisture. Soil structure, texture, tilth and tillage. Soil air, soil temperature. Effect of physical properties on nutrient availability.

Phytobiochemistry
Chemistry, Classification and synthesis of major constituents of plants viz. carbohydrates, fats and proteins (structures not required).
Amino-acids and their importance, R.N.A. and D.N.A. Enzymes- general composition, nomenclature, their actions. Factors affecting enzymatic activity. Biological importance of
vitamin A, B-Complex, C, etc. (structures not required).
Plant acids, their biosynthesis and distribution. Plant pigments carotenoids and chlorophylls.
Metaboism of carbohydrates, fats and proteins in plants, Kreb's cycle. Fermentation, ATP, ADP & AMP. Ripening in plants. Phytohormones Hydroponies Tissue culture. Absorption of nutrients by plants.
Chemistry of soils
Soil forming factors and minerals, weathering of rocks. Formation and development of soil profile. Chemical composition of soils, Process of soil formation viz. Laterization, podsolization, gleization, salinization, Kankar formation, peat formation and soil colour development.
Clay minerals, separation and identification of clay minerals.
Cation and anion exchange. Fixation of nutrients. Soil organic matter, humus its nature, properties and fractionation. Clay-humus complexes. Soil survey; types of soil survey, land-use, classification. Soil monoliths, soilcartography. Soilcrosion, factors affecting crosion. Methods of controlling soils erosion, soilconservation.
Soil classification, Detailed study of various classifications, 7th approximation. Classification of Indian Soils. Problem soils- Acid, Saline and Alkali soils; their development, amelioration and reclamation. Management of water-logging soils. The Quality of irrigation waters used in India.
Soil microbiology
Soil population. Soil medium for growth and activities of micro-organisms, Occurrence and distribution of Micro-organisms in soils. Classification of micro-organisms, Soil bacteria, Autotrophic and heterotrophic bacteria sulphuroxidizins, nitrifying and iron-oxidizing organism Cellulose and complex carbohydrates decomposing bacteria.
Nitrogen Cycle in Soil. Decomposition of plant residues, Soil algae, nitorgen fixation by blue greenalgae. Soil fungi an elementary study, Antibiotic and growth promoting substances. Soil inoculation, prepsaration of bacterial fertilizers. Role of microorganisms on the nutrient availability. Reclamation of alkali soils by sulphur oxidizing organisms.
Agrochemicals

- **Basic concepts and useof:**
  - Insecticides - Chlorinated hydrocarbons, organic phosphours compounds: Biological insecticides, Carbamates Arsenics, cluoridesetc.
  - Herbicides - Phenoxy compounds, Fluorosilicates substitutedureas.
  - Fungicides - Heavy metal compounds, glyoxyledine compounds, guanidines.
  - Rodenticides - General eyanides, phosphides, strychaine bariumcarbonate.
  - Nematocides - Carbamates andothers.
  - Fumigants- Diethylene dichloride anddibromide

Insecticide of botanical origin, Plant growth regulators, antibiotics. Formulation of pesticides and the chemistry of adjutants for pesticides. Trends in the development of pest control and allied chemicals, Biochemistry of the action of important pesticides, chemistry and residual control in the field of pesticides. Scope of pesticides, chemistry and residual control in the field of pesticides. Scope of pesticides in India. Persistence and control.
Environmental chemistry of soils
Distribution of elements, evolution of Earth. Origin and occurrence of clay minerals. Transformations of clay minerals under various conditions. Micropedology, microchemical methods used for investigation of soil Concept of soil fertility. Factors affecting soil fertility; Nutrients essential for plant growth, Mechanism of nutrients occurrence in soils and plants and their functions, forms, availability and deficiency symptoms of micro and macro nutrients. Factors affecting N, P and K avaliability in soils. Phosphate potential. Soil fertility evaluation. Soil testing, Lime requirement, gypsum requirement, Soil testing for advisory purposes. Cation xchange in soils. Exchange capacity of soils, Equations of cation exchange fixation of cation. Anion exchange. Fixation of anions. Soil. Soil pollution.

3. DEPARTMENT OF ANCIENT HISTORY, CULTURE & ARCHAEOLOGY

Founded in 1955 with the objective of promoting research and teaching in Ancient history, Culture, and Archaeology, as well as Ancient world civilizations and European History, the department is engaged in quality teaching, learning, and research right from the time of its inception. The department excavated the world-famous archaeological sites of Kaushambi, Belan Valley, and Middle Gangetic sites with outstanding results. The department was chosen for the Special Assistance Programme (SAP) by the UGC for three consecutive phases from 1981 to 1995. It was also granted the status of Centre of Advance Study (CAS) from 2001 to 2006. The department carried out international collaborations with a) the University of California, Berkeley (1980-82), b) the Soviet Union on the Project, "Comparative Archaeology and Ethno-Linguistic Studies" (beginning in 1980), and c) the Australian Research Council (2005-2008). The Department is internationally recognized for its studies in Archaeology, Socio-Economic Studies, Puranic Studies, and History of Art and Architecture. With facilities like G.R. Sharma Memorial Museum, Experimental Archaeology Lab, Archaeo-Zoological Lab, Lab of Archaeological Chemistry, Photographic Lab, Surveying Drawing Lab, and Departmental Research and PG Library, the department is credited with contributing substantially to archaeological research, understanding, and preservation.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Archaeology, Ethno-archaeology, Microscopic-archaeology, Socio-economic history, Art and Architecture, Religion and Philosophy, Numismatic and Paleography, Puranic Studies, Historiography, Science and Technology in Ancient India, Epigraphy, Defence and Strategic traditions.

🕮 SYLLABUS FOR CRET LEVEL-1 IN ANCIENT HISTORY, CULTURE & ARCHAEOLOGY

- **Ancient India (from earliest times to A.D. 1200)**

Sources: Literary, Archaeological and Foreign accounts (Greek Chinese and Arab).
Concepts, Ideas and Terms: Rta, Sabha and Samiti, Yajna, Varna, Ashramas, RnaSanskaras, Purusharthas, Agraharas, Kara/Vishti, Arthasastra Saptanga, Stupa, Chaitya, Nagar, Dravida, Vesara Mathura/Gandhara Schools ofArt.
Prehistoric Archeology: Paleolithic, Mesolithic, Neolithic and Chalcolithic. Indus Valley Civilization: Characteristics features, Origin, Geographical, Extent, Chronology, decline/Survival.
Iron Age: Antiquity, Second Urbanization. Iron and Megaliths.
Vedic Period: Early and Later Vedic Society, Economy, Political Institutions, Religious and Philosophical Ideas.
Early State Formation: The Mahajanapadas; Rise of Magadha from Bimbisara to Mahapadma, Nanda, Alexander's Invasion, bases and features of Monarchical states; Nature of the Republics.
The First Empire: Magadhan expansion in the times of Chandragupta Maurya – Administration, society and economy in the Mauryan period; Asoka, his Dharma; Decline of the Mauryan Empire.

- **Age of Political Fragmentation C. 200 BC–AD 300**

Sungas and Kanvas, Indo–Greeks, Sakas, Kushanas: Kanishka I (date and achievements), Western Kshtrapas, Kharavela.
Deccan and South India: The Satavahanas, Tamil States of the Sangam Age, Administration, economy, Sangam Literature and Culture.

- **Age of the Imperial Guptas**

The Guptas and the Vakatakas: Political History: Administration, Economic conditions: Coinage of the Guptas, Landgrants, Decline of Urban centres.

- **History of the Early Medieval India**

Harsha and the Regional States: Harsha and his military campaigns, education and educational. Institutions-Nalanda, Vikramashila and Vallabhisanskrit literature.
Gurjara-Pratiharas, Kalachuin-Chedis, Paramaras Arab Contacts-Ghaznavi Conquest, AlberuniPalas & Senas Pallavas and Chalukyas of Badami
Chalukyas of Kalyana and Cholas Administration and local government, Society, Economy and Culture during the Early-Medieval Period revolved around various aspects, including feudalism, trade guilds, the position of women, educational institutions such as Nalanda and Vikramashila, the growth of Vaishnavism and Saivism, as well as art and architecture.

- **Research in Ancient History**

The scope and value of history, objectivity and bias in history, history and its auxiliary branches, and the proposed area of research. Sources - primary/secondary in the proposed area of research.
Modern Historical writing in the proposed area of research.

- **Section A (Socio – Economic History) Earliest times to 1200 AD**

Sources, Social and economic life in Indus valley civilization, society and economic life in the Vedic Pd. Mauryan pd. Society and Economy from the 2nd century B.C. to the 3rd, 4th Century A.D.

  - Society and Economy in the Gupta Period, Varnashram system, Caste System, Slavary, Sanskaras, Purusharthas, Position of women, Education.
  - Agriculture, Industry and Industrial guilds andlabour.
  - Trade and commerce, Mercantile guilds, Taxation and Revenue system, Rural and urban settlements.
  - Feudal system, Social and Economic changes during early medievalperiod.
  - Transition from Antiquity to the early middle Ages, Feudalism social and economic changes during the early medievalperiod.

- **Section B (AncientIndiaArt&Architecture)**
  - Historiography, Approaches and Sources, Research Methodology in Ancient Indian Art & Architecture, the meaning of Art: Study of content ofArt.
  - Interplay of Regions, Artists and Patron, Margi and Desi Arts, Representing gender, Rituals.
  - Evolution and History of Architecture; Harappan, Mauryan, Rock–cut Architecture, Stupa Architecture, Temple Architecture: Gupta temples, Orissa, Khajuraho, Chalukyas, Rashtrakutas, Pallario, Cholas.
  - Indian and Western aestheticss.
  - Sculptural Art of the Mauryas, Shungas, Satanahanas, Kushanas, Guptas, Chandelas, Orissa, Pallava and Chola.
  - Origin and Development of Indian Iconography: Bodhisattva, Buddha, Adinath, Paraswanath, Mahavira, Vishnu, Shiva, Shakti, Surya.
  - Terracotta Art, Indus, Mauryan, Shunga, Kushana, Gupta, early medieval Regional traditions.
  - Paintings: Pre–Historic, Classical Painting traditions, Ajanta and Bagh.
- **Section C (Ancient Indian Religion and Philosophy)**
  - Sources, Foundations of Religious systems: Harappan, Vedic andSangam.
  - Sun Worship, Saivism, Vaishnavism, Janinism and Buddhism.
  - Rituals, Yajna, Educationalrites, Puranic Anuthana, Tirtha, Dana, Shraddha.
  - Philosophy of the Upanishads, Jain Philosophy, Buddhist Philosophy, Philosophy of Sankara and Gita.
  - Shaktism, Tantricism, Ascetic tradition and Bhabti.
  - Shankaracharya, Ramanujam and Lobayat.
- **Section D (Archaeological Studies)**
  - Hunting and gathering-Paleolithic and Mesolithic inIndia.
  - Beginning of Agriculture-Neolithic and Chalcolthic inIndia.
  - Indus valley Civilization origin, extent, date, characteristics, decline, survival.
  - Antiquity of Iron, second urbanizations iron andmegaliths.
  - Archaeological Methods and Techniques: Exploration, excavations and conservation of artifacts; dating techniques; importanceof stratigraphy in archaeology.

4. DEPARTMENT OF ANTHROPOLOGY

The Department of Anthropology was established in the year 1985 and was headed by the eminent anthropologist, the late Prof. A.R. N. Srivastava. Initially, the department was located in the Senate House Building of the University. In 2003, it was relocated to the Banda Guest House building of the University, and subsequently, since 2016, it has been situated in the newly constructed New Academic Complex of the University.

Since its inception, the Department of Anthropology has made significant contributions to the academic mission of the University. The department offers education at both undergraduate and postgraduate levels. It caters to both biological and social branches of the discipline and features well-equipped laboratories for Osteology, Osteometry, Prehistoric Archaeology, as well as an Anthropology Museum displaying the evolution of humanity through casts of human ancestors and cultural artifacts from present-day tribes of India. Notably, the anthropology course includes mandatory field training for students (both undergraduates and postgraduates) using modern research tools and techniques.

The present faculty members of the department adopt a modern approach to teaching and research. Their research interests span a wide range, from tribal issues to scientific analysis of the human body. The faculty's strong dedication to research is evident from the numerous research papers published in many reputable national and international journals.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Forensic Anthropology, Medical Anthropology, Physiological Anthropology, Development Anthropology, Human Growth & Development, Gender and Society, Bio-cultural Aspects of Human Health, Tribal Development, Reproductive Health.

🕮 SYLLABUS FOR CRET LEVEL-1 IN ANTHROPOLOGY

- **Social-Cultural Anthropology Fundamental:**

Unit 1 Meaning and scope of social- cultural Anthropology and its relations with other branches of Anthropology, Social Sciences, Life Sciences and Medical Sciences.

Unit 2 Social Organization: Family: Typology and Functions, Household and Domestic group, Processual analysis of Domestic group. Marriage: Definition, types and forms-preferential Prescriptive and Proscriptiveforms.

Unit 3 Kinship: Kin Types: consanguine, affinal; Kin group: lineage, clan, moiety and phratry; Principle and types of descent and residence; Kinship terminology: Morgan and Murdock: Kinship behavior: Joking and Avoidance relationship, Couvade, Avuculate, Amitate, Tecknonymy.

Unit 4 Economic Anthropology: Formalist and Substantivist approaches, Mode of exchange- Reciprocal, Redistributive and Market, Kula Potlatch.

Unit 5 Political Anthropology: State and stateless society, difference between primitive and modern law, Theories of origin of state.

Unit 6 Anthropology of Religion: Theories relating to origin of religion Animism, Animatism, Naturism, Functional theory of Durkheim, Psychological theory of Malinowski, Frazer's concept of magic, religion and Science. Totemism. Organization of religious belief and practices

- **Anthropological Thoughts:**

Unit 1 Anthropological notion of Culture: Society, Culture andCivilization

Unit 2 Evolutionism: Critical appraisal of 19th century Evolutionism; Contribution of: E.B.Tylor, L.H. Morgan, J. Frazer, H. Spencer, J.F. Mc Lennan, H.S. Maine, J.J. Bachofen.

Unit 3 Neo-Evolutionism: Contribution of V.G. Childe, J.H. Steward, L.A. White, M. Harris, Shalin and Service.
Unit 4 Diffusionism: Critical appraisal of British, German and AmericanSchools
Unit 5 Structure Functionalism: Contributions of A.R. Radcliff Brown and E.E. Evans Pritchard
Unit 6 Functionalism: Contribution of B. Malinowski
Unit 7 Culture and Personality: Contributions of M. Mead, R. Benedict, R. Linton, A. Kardiner, and Cora-du-Bois. Recent trends in Psychological Anthropology
Unit 8 Structuralism and Neo-Structuralism: C. Levi-Strauss, and E.R. Leach
Unit 9 Contribution of Indian Anthropologists: M.N. Srinivas, L.P. Vidyarthi, S.C. Roy, D.N. Majumdar and N.K. Bose
Unit 10 Recent Trends: New Ethnography and Post Modernism in Anthropology

- **ResearchMethods:**

Unit 1 Scientific Method: Characteristic; Basic Terms; Techniques, Methodology, Primary and Secondary Data; Social Survey & Social Research
Unit 2 Fieldwork tradition in anthropology: Its relationship with the development of anthropological theories Unit 3 Approaches: Emic-etic, Macro-micro
Unit 4 Methods: Ethnography, Comparative method, Participant Observation, Genealogical method, Case study, Survey
Unit 5 Techniques of Data Collection: a) Primary sources: Observation, Interview, Key informant, Schedules and Questionnaires, Life history, Focused Group Interview, RRA, PRA, Audio-Visual Recording (b) Secondary sources: Census, National Sample Survey, Documents and Records, Maps, National and International reports (UNDP, World Bank, UNICEF, etc.)
Unit 6 Hypothesis; Research Design; StatisticalMethods.

- **Physical/ Biological Anthropology**

Unit 1 Introduction: Meaning, Scope and Branches of Physical Anthropology; Relations with other branches of Anthropology and with Biological, Social and Medical Sciences.
Unit 2 Primatology: General Characters of Order Primate, Primate Classification, Man's place in the animal kingdom, Comparative Anatomy of Man and Apes; Hominid Evolution: Erect Posture and Bi-pedalism.
Unit 3 Human Origin and Evolution: Theories of Organic Evolution, Lamarckism; Darwinism and Synthetic theory.
Unit 4 Emergence of Man: Primate Evolution with reference to Skull, Jaw, Limbs, Dentition and Brain. Earliest primates of Oligocene, Miocene and Pliocene- Aegyptopithecus, Propliopitecus, Dryopithecu, Proconsul. Ramapithecus, Australopithecus, Homo erectus, Neanderthal, Homo sapiens: Cro- Magnon and Grimaldi and Hominisation Process.
Unit 5 Human Genetics: Methods for studying genetic principles in Man- Family studies, Twin Studies, Pedigree Analysis, DNA technology; Meiosis and Mitosis; Linkage andcrossing- over; Mutation-gene mutation, mutation rate, genetic hazards of radiation, chemical mutagenesis; Human Chromosomal aberrations- Numerical: Turner's syndrome, Klinefelter's syndrome, Tripio- X, Triploial-X, Tetra-X, Down's syndrome, Pateu's syndrome, Edward's syndrome, Sturge-Weber's syndrome, Tripliody and Tetrapliody, and Structural: Cri-du-chat syndrome and Philadelphia chromosome; Mendelian genetics in Man, Inheritance Pattern of Autosomal, Sex- linked, Codominant traits, Lethal factors, Polygenic and Multifactorial traits; Inborn Errors of Metabolism-Biochemical Pathways (one gene one enzyme hypothesis) and heredity of Phenylketonurea, Alkaptonurea, Galactosemia, Albinism.
Unit6 Population Genetics: Hardy Weinberg Law, Genetic polymorphism, Inbreeding and Genetic Load.
Unit7 Applications of Human Genetics: Genetic Screening, Genetic Counseling and Genetic Engineering.
Unit8 Applied Physical Anthropology: (i) Anthropology of Sports, (ii) Nutritional Anthropology, (iii) forensic Anthropology.
Unit9 Introduction to Human Biology: Meaning, Scope and Development of Human Biology
Unit 10 Human Growth and Development: Growth from Conception to Maturity and Senescence, Factors Affecting growth and Theories of Ageing
Unit 11 Nutrition and Growth: Nutritional Requirements for Normal Growth from Infancy to Old Age. Under nutrition and Malnutrition, Nutritional Adaptation in Man

Unit 12 Human Adaptation: Physiological Adaptation to Heat, Cold and High Altitude
Unit13 Demography: Population Structure and Composition, Demographic Processes: Fertility, Mortality and Migration, Demographic Theories.
Unit 14 Race: Concept of Race, Basis of Racial Classification, Racial Classification of Indian population, Negrito Element in India andRacism
Unit 15 Population Variation in Qualitative Traits: Hbandits Variants, G6PD, Transfer in, ABH Secretion and Lewis Antigen, Histocompatibility, Antigen and Thalassaemia.
Unit 16 Genetics of Blood Group: Genetic markers- ABO, MNSs andRh blood group systems, Red Cell Enzymes- Red cell acid phosphate, phosphoglucomutase, adenylate kinase, adenosine deaminase and lactate dehydrogenase, Blood groups and diseases- Erythroblastosis fetalis, smallpox and malaria, Gene mapping- Blood groups, HLA, Sex-linked characters
Unit 17 Dermatoglyphics: History, Identification, Topography; Fingerprints Pattern– Identifications, Inheritance, Pattern intensity, Furuhata and Dankmeijer's index; Palmar Dermatoglyphics – Configurational areas, Main-line formula and index, Transversality, Inheritance, Palmar flexion creases and main types; Sole Prints - Configurational areas, Main-line formula and index, Transversality, Inheritance; Toe Prints–Pattern, Identification, Inheritance; Dermatoglyphics and Diseases, Dermatoglyphics and Paternity disputes.

- **Archaeological Anthropology:**

Unit 1 Definition, Aim and Genesis of the Sub-Field: Relationship to other branches of anthropology, Earth Sciences, Physical sciences and Social sciences, Environmental Archeology, Ethno-Archeology, Settlement Archaeology, New Archaeology.
Unit 2 A Brief Outlines on the Origin of Earth and Life: Geological time scale, Pleistocene epoch-Chronology, environmental episodes as seen in Geomorphological features.
Unit 3 Dating Methods: Absolute and Relative dating, Stratigraphy, River terraces, Obsidian hydration, Dendrochronology, thermoluminescence dating, Pollen dating, Varveanalysis, Uraniumdating, Potassium-argon method, Fluorine dating, C-14 AminoAcid racemization.
Unit 4 Tools and Technology: Raw material and sources, tool making Techniques and Tool Types.
Unit 5 Lithic Cultures of Europe: Sites, Tool Types and Salientfeatures
Unit 6 Paleolithic Culture in India: Sites, Tool Types and Salient features.
Unit 7 Mesolithic Culture in India: Sites, Tool Types and Salient features.
Unit 8 Neolithic Culture in India: Sites, Tool Types and Salient features.
Unit 9 Megalithic Culture in India: Sites, Tool Types and Salient features.
Unit 10 Indus Valley Civilization: Main features, Town planning, economy, Polity, Religion, Art and Craft, Script and Causes of end.
Unit 11 Beginning of Iron Age and Second Urbanization: Economic and Social implications of Iron technology; Black and Red ware culture – Noh, attranji, Khera, Ahikshatra; Painted Grey Ware (PGW) Culture–Distribution, Economy and Society; Northern Black polished (NBP) ware culture-irstcities in the Ganga valley and emergence of the Mauryan Empire.

- **Indian Anthropology and Developmental Anthropology**

Unit 1 Indian People: Racial, Ethnic, Linguistic and Religious elements (composition) and Distribution of People in India; Unity and diversity in Indian society and culture.
Unit 2 Basis of traditional Indian social structure and Life cycle: Varna, Ashram, Purushartha, Dharma, Karma, Sanskar, Caste system and JointFamily.
Unit 3 Impact of Buddhism, Jainism, Islam and Christianity in India.
Unit 4 Indian Village: Myth or reality; Jajmani System; Impact of new technology and Urbanization-changing agrarian social structure; Village Studies in India
Unit 5 Tribal societies: Definition and identification of tribe/scheduled tribe; Classification and distribution of tribes based on economic, Cultural, Linguistic and racial classification, Tribe Caste Continuum; Tribal Absorption/ Assimilation/Integration.
Unit 6 Constitutional provisions for scheduled castes/scheduled tribes: Tribal Policy and governance in British India, Evolution of Tribal Development policy and Programs, Tribal Movements.
Unit 7 Growth of Anthropology in India.
Unit 8 Socio-cultural change: Sanskritisation, Parochialisation, Universalisation, Great-Little Traditions, Sacred Complex, Nature-Man-Spirit Complex, Westernization, Industrialization, Urbanization and

Globalization.

Unit 9 Problems of Tribes in India: Land Alienation, Indebtedness, Health and Nutrition, Deforestation and Migration.

Unit 10 Development: Meaning and Evolution of the concept, Indices and Measurements of Development theories and Models

Unit11 Applied, Action and Development Anthropology: Meaning, Scope and the Emerging Trends, Contributions of Anthropology to the Development Studies, Moral/Ethical issues and Limitations of Development Anthropology

Unit 12 Policy and Planning: Concept of Planning, Formulation of Policy and Plan Strategy, Participatory Approach in Development Planning, Conflict in People Centered and Programme Centered Paradigms

Unit 13 Approaches to Development: Governmental Approach, Missionary Approach, NGO's Approach, Philanthropist Approach, Social Workers Approach, and Anthropological Approach

Unit 14 Role of Values and Institutions in Development: Caste, Religion and Culture- Bailey, Milton Singer and Madan

Unit 15 Rural Development in India: Historical Background, Special Programmes and Poverty Alleviation Programs, Land Reforms and Panchayati Raj

Unit 16 Development of Scheduled Castes and Scheduled Tribes: Special Component Plans, Constitutional Provisions and Safeguards, Protective Legislation; Structure of Tribal Development Administration; Evolution of Tribal Sub Plans; Problems and Prospects of Tribal Development.

Unit 17 Sustainable Development.

5. DEPARTMENT OF ARABIC AND PERSIAN *(ARABIC)*

The Department of Arabic and Persian is dedicated to the study and research of two important languages and cultures: Arabic and Persian. These languages have rich literary, historical, and cultural traditions that span centuries, making them excellent subjects for academic inquiry. Our department aims to foster advanced scholarship and contribute to the broader understanding of these languages and their associated cultures.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Literature: Research in Arabic and Persian literature encompasses various periods and genres, from classical poetry to contemporary prose. Scholars explore the works of renowned authors, themes, and literary movements and trends within these languages.

Linguistics: Linguistic studies in Arabic and Persian include phonetics, syntax, semantics, and sociolinguistics. Researchers investigate language structure, language acquisition, and linguistic evolution within these languages.

Cultural Studies: This domain explores the cultural aspects of Arabic and Persian-speaking regions, including history, art, music, religion, and customs. Researchers delve into the cultural dynamics that have shaped these societies.

Translation Studies: Ph.D. candidates may focus on the translation of Arabic and Persian texts into other languages or vice versa. This field explores the challenges and strategies involved in translating between these languages.

Comparative Studies: Researchers may compare Arabic or Persian literature to other literatures like Hindi or Urdu.

🕮 SYLLABUS FOR CRET LEVEL-1 IN ARABIC

1. History of Arabic Language and literature : تاريخ اللغة العربية و آدابها

(الف) الشعر القديم

(١) المعلقات السبع

(٢) حسان بن ثابت

(٣) جرير

(٤) الاخطل

(٥) ابن زيدون

(٦) بشار بن برد

(٧) الفرزدق

(٨) أبو العلاء المعرى

(٩) ابن المعتز

(١٠) ابن الرومى

(ب) النثر القديم

(١) القرآن المجيد

(٢) الحديث النبوى

(٣) الجاحظ

(٤) بديع الزمان الهمدانى

(٥) الحريرى

(٦) عبد الحميد الكاتب

(٧) ابن العميد

(٨) القاضى الفاضل

(ج) الشعر الحديث:

(١) احمد شوقى

(٢) حافظ ابراهيم

(٣) خليل مطران

(٤) محمود سامى البارودى

(٥) معروف الرصافى

(٦) نازك الملائكة

(٧) صلاح عبد الصبور

(٨) جميل صدقى الزهاوى

(د) النثر الحديث

(١) مصطفى لطفى المنفلوطى

(٢) خليل جبران جبران

(٣) طه حسين

(٤) عباس محمود العقاد

(٥) سيد رشيد رضا

(٦) يوسف ادريس

(٧) أحمد امين

(٨) على طنطاوى

(٩) يحى حقى

(١٠) احسان عبد القدوس

2.Principles of Literary Criticism: مبادئ النقد الادبى

(الف) القديم

(١) قدامة بن جعفر

(٢) ابن قتيبة

(٣)ابن رشيق

(٤) عبد القاهر الجرجانى

(ب) الحديث

(١) عبد القادر المازنى

(٢) طه حسين

(٣) شوقى ضيف

(٤) ميخائيل نعيمة

(٥) محمد مندور

3.General Knowledge المعلومات العامة

[CORE GROUP]

Classical Arabic Prose & Poetry. Study of the Following Poets:

(١) الشعر و النثر العربى القديم (دراسة الشعراء المذكورين ادناه)

(الف) الشعر

(١)امرؤ القيس

(٢) نابغة الذبيانى

(٣) فرزدق

(٤) جرير

(٥) الأخطل

(٦) عمر بن ابى ربيعة

(٧) ابو نواس

(٨)بشار بن برد

(٩) جميل بثينة

(ب) النثر

- الخطابة (قبل الاسلام،العصر الاسلامى،الاموى)

(١)قس بن ساعدة الأيادى

(٢) سحبان وائل

(٣) على بن ابى طالب

(٤) حجاج بن يوسف

(٥) زياد بن ابية

(٦) طارق بن زياد

- الجاحظ
- ابن المقفع
- المقامات

الأدب العربى الهندى (دراسة المؤلفين و الكتب) :Indo-Arabic Literature

(الف) النثر

(١)الشيخ عبد الحق محدث الدهلوى

(٢)ملا محمود الجونفورى

(٣) سيد غلام على آزاد البلغرامى

(٤) شاه ولى الله الدهلوى

(٥) عبد الحى الحسنى

(٦)سيد ابو الحسن على الندوى

(ب) الشعر

(١) فضل حق الخيرآبادى

(٢) فيض الحسن السهارنفورى

(٣) انور شاه الكشميرى

(٤)نواب صديق حسن خاں

(٥) ذو الفقار على الديوبندى

(٦)شاه ولى الله الدهلوى

Important Works of Indo-Arabic Literature الأعمال الهامة فى الأدب العربى ـ الهندى

(١)تحفة المجاهدين

(٢) سبحة المرجان

(٣) نزهة الخواطر

(٤) رجال والهند السند

(٥) رجال الفكر و الدعوة

(٦) ماذا خسر العالم بانحطاط المسلمين

Modern Arabic Language & Literature: Study of the Following Poets and Authors ;

اللغة العربية و الادب العربى الحديث: (دراسة الشعراء و الأدباء المذكورين ادناه)

(الف) النثر

(١) جبران خليل جبران

(٢) مصطفى لطفى المنفلوطى

(٣) طه حسين

(٤) أحمد امين

(٥) توفيق الحكيم

(٦)نجيب محفوظ

(٧) محمد حسين هيكل

(٨) عباس محمود العقاد

(٩) رفاعة الطهطاوى

(١٠) مصطفى صادق الرافعى

(ب) الشعر

(١) محمود سامى البارودى

(٢) احمد شوقى

(٣) خليل مطران

(٤) حافظ ابراهيم

(٥) ايليا ابو ماضى

(٦) نازك الملائكة

(٧) ابو القاسم الشابى

(٨) عمر ابو ريشة

Major Reference Works: : اهم المراجع

(١) سيرة بن هشام

(٢) تاريخ الطبرى

(٣) طبقات بن سعد

(٤) فهرست بن نديم

(٥) كتاب الأغانى

(٦) معجم الأدباء

(٧) فتوح البلدان

(٨) وفيات الأعيان

(٩) مقدمة بن خلدون

(١٠) العقد الفريد

(١١) كتاب البخلاء

(١٢) البيان و التبيين

(١٣)الأدب الكبير

(١٤) الأدب الصغير

Tafsir and Hadith Literature: (دراسة الأعمال التالية) التفسير و الحديث :

(١)التفسير الكبير

(٢) تفسير الكشاف

(٣) تفسير جلالين

(٤) فى ظلال القرآن

(٥) المنار

(٦) الصحيحان

(٧) نظام القرآن

(٨)أخبار الأخيار

History Of Islamic Civilisation: تاريخ التمدن الاسلامى

(١)فجر الاسلام احمد امين

(٢) ضحى الاسلام احمد امين

(٣) ظهر الاسلام احمد امين

(٤) الثقافة الاسلامية فى الهند عبد الحى

(٥)تاريخ التمدن الاسلامى جرجى زيدان

: Literary Genres, Movements and Institutions :

الأجناس الأدبية و الحركات و المؤسسات

(١) كتب في السيرة النبوية

(٢) الموشحات

(٣) الحركة الرمزية

(٤) ادب المهجر

(٥) الرابطة القلمية

(٦) العصبة الاندلسية

(٧) مدرسة الديوان

(٨) حركة ابولو

: Rhetoric and Prosody: علم البلاغة و العروض:

(١) البحر الطويل

(٢) البحر الكامل

(٣) الفصاحة

(٤) البلاغة

(٥) علم المعانى

(٦) علم البيان

(٧) علم البديع

: Principles of Literary Criticism: مبادئ النقد الأدبى

(١) تطور الشعر العربى

(٢) تطور النثر العربى

(٣) تطور القصة فى الأدب العربى

(٤) المسرحية القصة القصيرة والرواية

[ELECTIVE / OPTIONAL]

Elective-I :	Functional Arabic	الإنشاء
Elective-II :	Arabic Criticism :	تاريخ النقد العربى
Elective-III :	Migration Literature	أدب المهجر
Elective-IV :	History of Arabic Literature	تاريخ الادب العربى
Elective-V :	Arabic Studies in India	الدراسات العربية فى الهند

6. K. BANERJEE CENTRE OF ATMOSPHERIC AND OCEAN STUDIES

The K. Banerjee Centre of Atmospheric and Ocean Studies (KBCAOS) was established by the UGC as a center with the potential for research excellence in the field of Climate Dynamics. The center currently runs an M.Tech. program in Earth System Sciences and a Ph.D. program in Atmospheric and Ocean Sciences. The teaching courses and research programs of the KBCAOS are designed to develop a deep understanding of the fundamental principles of Atmospheric and Ocean Sciences, along with the innovative ability to solve new and challenging problems. These programs, with a strong research component, provide specialized and focused training as per the requirements of weather services in India and the research interests of world organizations.

In the center, successful implementation of research projects based on observational and modeling studies, with funding of more than ₹10.00 Crores, has been carried out with generous support from ISRO, MOES, UGC, DST, and the Government of India. The center has received the DST-FIST Grant of ₹1.17 Crores for the procurement of instruments related to land-atmosphere interaction and hydrological research, as well as for infrastructural development.

The multidisciplinary field of Atmospheric and Ocean Sciences, which is interesting to study, socio-economically relevant, and simultaneously challenging in terms of research, is forever evolving, providing increased opportunities and employability. The KBCAOS is striving hard toward the development of high-quality scientific manpower to cater to the needs of R&D organizations, educational institutions, and the industry.

🛠 RESEARCH DOMAINS OFFERED AT THE CENTRE

Mathematical Modeling of Atmosphere, Ocean, and Land; Indian Monsoon Prediction and Predictability: Chaos and Nonlinear Dynamics; Data Assimilation; Remote Sensing and GIS; Biometeorology, Agrometeorology.

🕮 SYLLABUS FOR CRET LEVEL-1 IN ATMOSPHERIC AND OCEAN SCIENCES

Mathematical modeling, Probability density function, Noise (Red, White) distribution, Curve fitting, Statistical Methods, Significance tests, Knowledge of programming and algorithms, Operating systems, Numerical Analysis, Ordinary and Partial Differential Equations, Fundamentals of Atmosphere and Ocean systems, Weather and Climate, Composition and structure of atmosphere, Momentum Equations, Thermodynamics of the atmosphere, Radiation Laws, Heat budget, Properties of seawater, Temperature, Salinity, Density, Indian Monsoon, ENSO, Methods of research and good laboratory practice.

7. CENTRE OF BEHAVIOURAL & COGNITIVE SCIENCES

Established as the Centre with Potential for Excellence in a Particular Area (CPEPA), the Centre of Behavioural and Cognitive Sciences (CBCS) provides superior education of merit and distinction. It aligns with the latest developments and challenges in the field of Cognitive Science, emphasizing both basic and applied research to contribute to science and society. Research at CBCS spans multiple domains, including attention, visual perception, consciousness, time perception, emotions, cognitive control, decision-making, literacy and cognition, memory formation, cognitive and affective development, aging, bilingualism, music cognition, neuroaesthetics, language processing, consumer neuroscience, and yoga and meditation. We employ various methodologies, such as behavioral experimentation, functional MRI, EEG/ERP, and eye tracking.

🛠 RESEARCH DOMAINS OFFERED AT THE CENTRE

Applied fields of Cognitive Sciences.

🕮 SYLLABUS FOR CRET LEVEL-1 IN BEHAVIOURAL & COGNITIVE SCIENCES

- **General Issues and Foundations of Cognitive Science**

Information processing approach, Marr's levels of processing, Representations, Dynamical approaches, Situated and Embodied cognition, Modularity, Culture and Cognition, Cognitive Development, Different methodologies used in Cognitivescience, ReactionTime measurement and analysis, Signal detection theory, Eyetracking.

- **Research Methods**

Qualitative vs quantitative methods, Scientific Method, Purpose of statistics, Different kind of Variables, Probability, Distributions, Sampling, Experimental Designs (Independent samples design, Repeated measure design), Validity (Validity in Experiments and other research design, types of validity), Quasi – experiments, Analysis: Correlations, t-tests, nonparametric tests, ANOVA (factorial, mixed), Introduction toRegression

- **Computing**

Basics of programming, algorithmic problem solving, data structures, associative structures, Basic algorithms (sorting, searching, etc.)

- **Cognitive Neuroscience**

Functional organization of the cortex, Methods (Electroencephalography/ 'Event related potentials, functional magnetic resonance imaging), Cognitive neuroscience of perception, language, learning and memory, motor systems, emotions, and hemispheric lateralization.

- **Computational Models of Cognition**

Introduction to Computational Modeling, Types of learning mechanisms and learning rules, Introduction to neural networks, Probabilistic reasoning, Production Systems, Cognitive Architectures

- **Perception *and* Attention**

Principles of perception, Different theoretical approaches to perception (Gibson, Helmholtz, Gestalt, etc.), Color Perception, Perceptual organization, Object recognition, Motion and Time perception, Selective Attention, Sustained Attention, Divided Attention, Executive Control.

- **Learning and Memory**

Principles of classical conditioning and operant conditioning, Theories of Learning, Reinforcement schedules, Skill Acquisition and Performance, Sensory memory, Working Memory, Models of Semantic Memory, Autobiographical Memory, Retrieval, Forgetting, Implicit learning and memory.

- **Psycholinguistics**

Introduction to Linguistics, Biological basis of language, language evolution, Design features of language, Foundations of Psycholinguistics, Methodological considerations, History, Current approaches, domains of study, Links withot herdisciplines, Levels of linguistic analysis: Phonology-phonetics, syntax, semantics, morphology, pragmatics, Word Recognition, Sentence processing, Language Acquisition, Bilingualism, Language-Visioninteraction.

Decision Making

Heuristics and Biases, Bounded rationality, Theories of utility and Paradoxes, Choice under uncertainty, Neuroeconomics of individual and collective decision making, Game theory, Computational Models of decision making.

- **Philosophy of Mind**

Different views on mind-brain relationship, functionalism, eliminative materialism, fundamental issues on self and consciousness, representationalism, phenomenological approaches. Language and thought.

Suggested Readings:

Baddeley, A. (2003). Human Memory: Theory and Practice.
Churchland, P. Matter and Consciousness. Cambridge: MIT Press.
Coolican, H, (2009). Research Methods and Statistics in Psychology. Hodder Education.
Cormen, T., Leiserson, C., Rivest, R. & Stein, C. (2002), Introduction to Algorithms. Prentice Hall of India, 2002.
Gazzaniga, M.S. (2009). The Cognitive Neurosciences, 4th Edition, MIT Press.
Harley, T. (2008), The Psychology of Language. Psychology Press.
Kerlingcr, F.N & Lee, H.B. (2000). Foundations of Behavioural research. Australia: Wadsworth Thomson Learning.
Mazur, J.E. (2006), Learning and Behaviour. NJ: Pearson Prentice Hall.
Polk, T., & Seifert, C. (2004), Cognitive Modelling, MIT Press.
Russell, S., & Norvig, P. (2003). Artificial Intelligence: A Modern Approach, Second Edition, Prentice Hall of India.
Solso, R, L. Cognitive Psychology. India: Pearson Education.
Eysenck, M. & Keane, M. Cognitive Psychology: A Student's Handbook. Psychology Press. Palmer, S.E. Vision Science: Photons to Phenomenology. Cambridge: MIT Press.
Ward,J. (2006). The Student's Guide to Cognitive Neuroscience. Hove: Psychology Press
Yegnanarayana, B, (2009). Artificial Neural Networks, Prentice Hall of India.

8. DEPARTMENT OF BIOCHEMISTRY

The Department of Biochemistry was established in 1968. At that time, it was among the few independent departments of Biochemistry in the country. The Department has produced a large number of famous Biochemists who are presently heading various research establishments in the country and abroad. Three scientists from the Biochemistry department find mention in the top 2% list of scientists in the world ranking released by Stanford University, USA.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Mechanistic aspects of aging, anti-aging interventions, metabolic disorders, antioxidants and bioactivity of natural products, cancer biology, degenerative disorders, antimicrobial interventions, bioactivity of natural products, implications for human health

🕮 SYLLABUS FOR CRET LEVEL-1 IN BIOCHEMISTRY

- **BIOPHYSICS, ANALYTICAL AND PREPARATION TECHNIQUES IN BIOCHEMISTRY:**

Electrochemistry: pH, Buffers, Enzyme Electrode, Biosensors.
Energetic and Thermodynamics considerations: Laws of Thermodynamics, Gibbs Free, Energy, Biological Order. Coupled Reactions, Ion–Electrochemical potentials. Entropy, Low–and–High Energy Compounds, Energy Inter conversions.
Biophysical Techniques Principles and Application to Biological Problems: Atomic Absorption and Emission Spectroscopy, NMR, EPR Spectroscopy, ESR Spectroscopy, Mass Spectroscopy, X– Ray Diffraction, Circular Dechroism, MALD–TOF, FRAP.
Centrifugation Techniques: Differential, Zonal, Density gradient and Ultracentrifugation.
Chromatography: Adsorption Partition, Ion–Exchange, Reverse–Phase, Covalent, Gel Filtration. Affinity Chromatography, HPLC, FPLC, Chromatofocusing.
Electrophoretic Techniques: Paper and Gel Electrophoresis (Agarose–and SDS) 2–D Gel Electrophoresis, Pulsed–Field Gel Electrophoresis, Isoelectric Focusing.
Immunological Techniques: Gel Diffusion, Immunoelectrophoresis, Ouchterlony, ELISA, Immunoblotting, Fluorescent Immunoassays.
Photometry: Principles and Instrumentation of a Sample and Double– beam Spectrophotometer, Application of Colorimetry, Spectrophotometry (Visible, UV and IR), Fluorimetry.
Microscopy: Principles and application of Light, Phase–contrast and Electron Microscopy (TEM, SEM and Immune electron–Microscopy {IEM}).
Radioisiotopic Tracer Techniques: Detection and measurement of isotopes, GM and Scintillation Counters, Autoradiography, Fluorography, Applications in biological problems.

- **CHEMISTRY OF BIOMOLECULES:**

The molecular logic of life: The identifying characteristics of living matter The chemical unity of diverse living systems.
Biomolecules: Their meaning and importance in the functional organization of the cell. Information and non-informational biomolecules.
Carbohydrates: Structure, properties classification, function and biological importance. Mono–, di– oligo and polysaccharides. Chain and ring structures. Optical isomerism. Homopolysaccharides, glycolipids, proteoglycans, mucopolysaccharides, peptidoglycans, hemicelluloses, lignins Bioactive carbohydrates.
Lipids: Structure properties, classification function and biological importance. Storage lipids. Structural lipids in membranes Phosphoglycerides, Plasmalogens (Lecithins, PE, PS Phosphatidylinositols), Sphingomyelims, Ceramides, Glycolipids, Prostaglandins. Lipids as signaling molecules, cofactors and

pigments. Phosphatidylinositol–based lipids in cell signaling.
Proteins: Classification and functional diversity of proteins. Amino acids–classification and properties. Overview of Protein structure Primary, Secondary, Tertiary and Quaternary structures. Protein denaturation. Sequencing, Protein folding, Structure– function relationship.
Nucleic acids: Structure of nucleotides and formation of polynucleotide chain. Structure and function of DNA and RNA. Watson Crick model of DNA. Various forms of DNA. Nucleic acid chemistry. Cofactor functions of nucleotides.
Plant–based polyphenols: Classification, structure and biological activity.
Vitamins: Chemistry and Function
Hormones: Chemistry and Classification.

- **PHSIOLOGY AND ENDOCRINOLOGY OF THE HUMAN BODY:**

Functional organization of the human body and homeostasis: Intracellular and extracellular division of body fluids, the concept of homeostasis and feedback control systems. **Cell:** Structure and function. Major transport mechanisms through the cell membrane.
Nerve–impulse transmission system: Sensory and motor nerves, major levels of nervous system function, Central and autonomic nervous system. Generation of nerve impulse: Membrane potentials, action potentials, transmission of nerve impulse, synapse, neurotransmitters.

- **Sleep Biology:**

Digestion and absorption in the Gastrointestinal tract: Digestion and absorption of carbohydrates, fats and proteins. Endocrine control of digestive and absorptive processes. **Blood:** Composition of blood. Functions of Erythrocytes. Homeostasis, Blood group substances, transfusion and tissue transplant.
Role of Leucocytes in body's fight against infection. Elements of the immune response. Humoral and cell mediated immunity. Immunoglobulins. Principles of vaccination.

- **The Cardiac cycle and ECG:**

Circadian Rhythms
Regulation of acid: base balance: Role of buffers in blood, respiratory control, renal controls.

- **Transport and exchange of respiratory gases:**

Body fluids: Extracellular, intracellular, Osmotic principles in maintenance of fluid balance.
Principles of Urine formation: Glomerular and tubular function. Mechanisms for control of urine composition.
Principles of endocrinology: Chemical control of metabolism.
Hormones in the regulation of metabolism: Target organs and feedback controls.
Hormones: Pituitary, Thyroid, Adreno cortical hormones, Insulin and Glucagon, functions and clinical implications. Sex hormones. Hormones in pregnancy. Hormonal control of location. Brest milk production and its role in contraception. Growth factors Mechanism of hormone action, signaling pathways, G proteins, second messengers, lipids as signaling molecules.

- **Control of water and electrolyte metabolism:**

Parathormones: Calcitonin. Vitamin D. Role in calcium metabolism and bone function.

- **Prostraglandins:**

The body's natural opiate system: Endorphins and enkephalins.

- **Biochemistry of Odorant Receptors:**
- **ENZYMOLOGY:**

Historical Perspective Enzyme Classification
Recommendation and Systemic Nomenclature
Enzyme Chemistry: Subcellular Distribution of Enzymes. Isolation and Purification of Enzymes, Criteria for Enzyme homogeneity, General Properties, Enzyme Activity, Specific Activity and Turnover Number, Marker, Enzymes.
Enzyme Kinetics: Enzyme Substrate Interactions, ES Complex, Binding Site, Active Site. Specificity, Steady State, Pre–Steady State and Equilibrium–State Kinetics, Michaelis–Menten Equation and its derivation, Graphical Methods for determination of K*m* V*max* and their significance.
Factors affecting Initial rate of Enzyme catalyzed Reaction: Enzyme, Substrate, pH temperature Collision and transitional state theories, Significance of Activation, Energy, Mechanism of bisubstrate and multisubstrate reaction, Methods for identifying mechanism.

Enzyme Inhibition and Activation: Types of inhibition, and activation, Competitive non– competitive and Uncompetitive inhibitors, Determination of Ki, Suicide inhibitors.
Mechanism of Enzyme action: enzyme–substrate complementarity, Stereochemistry of enzyme substrate action, factors associated with catalytic efficiency.
Enzyme regulation: Allosteric and Hysteric Enzymes, Proenzymes, Zymogens and activation.
Structure and Function of Selected Enzymes: Chemical modification of active–site group, substrate/driven mutagen, etc. Chymotrypsin, Glyceraldehyde–3P– Dehydrogenase, Serine and Cysteine proteases

- **Multi Enzyme Complexes**

Immobilized Enzymes: Immobilization methods, Kinetics, Industrial applications

- **Enzyme engineering and Co–Factor Engineering Ribozymes, Abzymes**
- **INTERMEDIARY METABOLISM**

Introduction to metabolism: Basic concepts and design.
Carbohydrate metabolism: An overview of aerobic and anaerobic carbohydrate metabolism. Glycolysis and the catabolism of hexoses. Feeder pathways. Regulation. Pentose phosphate pathway. Utilization of glycogen. The Citric Acid cycle. Anaplerosis Regulation. The glyoxylate cycle. Carbohydrate biosynthesis. Gluconeogenesis. Glycogen synthesis. Glucoronic acid pathway, Photosynthesis. Light and dark reactions. Electron flow. ATP synthesis by photophosphorylation.
Lipid metabolism: Introduction to Lipids as energy sources. β oxidation. Oxidation of unsaturated and odd chain fatty acids Ketone bodies.
Biosynthesis of: Fatty acids. Triacyl glycerols. Membrane phospholipids. Cholesterol, steroids and isoprenoids. Membrane Phosphoinositides, Ceremides.
Protein Metabolism: Metabolic fate of amino groups. Transamination and deamination. Essential and non–essential amino acids. Nitrogen excretion and the Urea cycle.
Pathways of amino acid degradation. One carbon transfers, role of Tetrahydrofolate and S–adenosyl methionine.
Overview of Nitrogen Metabolism. Biosynthesis of amino acids and compounds derived from amino acids.
Oxidative phosphorylation: Electron transport chain and formation of ATP. Regulation Biochemical role of vitamins and minerals as coenzymes and cofactors Integration and hormonal regulation of metabolism.

- **MOLECULAR CELLULAR BIOLOGY**

Ultra-structure of Cell: Study of Cells Organization of Cellular components
Nucleic Acids as Genetics Repositories: Genetics Transformation, Hershey–Chase Experiments, Gene Transfer Mechanisms in Bacteria (Transformation, Conjugation and Transduction, Transfection)
Molecular Basis of Mutations: Insertional mutagenesis, Transversions, Frame–Shift mutation, Suppressor mutation.
Mapping of Bacterial Chromosomes: Site–directed mutagenesis, PCR Technology, DNA–Footprinting.
Structure and Replication of Nucleic Acids: Structure of RNAs, Structural polymorphism of DNA, RNA and 3–D structure, Hybridisation, Heteroduplex analysis, Models of replication, Histone and Non–Histone proteins, Nucleosome structure, Eukaryotic genome.
DNA Replication Mechanism: DNA Polymerases, DNA ligases, Gyrases, Nucleases, Restriction Endonucleases and their use in Gene Cloning, Replication in vitro, Organisation and direction of replication, Okazaki Fragments, Differences between Pro– and Eucaryotic DNA replication.
DNA Damage and Repair: Gene amplification, Sequence rearrangement,

- **Recombinant DNA technology, Biology of Cloning vectors:**

Gene Cloning: Plasmids Bacteriophages, Cosmids, Phagemids, BACs, YACs and HACs as Cloning vehicles, Genomic Library and cDNA libraries.
Organisation and Regulation of transcription: Mechanisms of transcription in Pro– and Eucaryotes, RNA processing events (capping, poly A Tailing, Splicing, Introns, Exons, Splicing) Spliceosome, Ribonucleoparticles, Structure of mRNA, tRNA Transcription in vitro RNA Poymerase and factors, Self–splicing RNA (Ribozymes)
Replication of RNA Viruses: Replicase and Reverse Transcriptase

- **Translation in Prokaryotes and Eukaryotes: Mechanism and Regulation:**

Involvement of Ribosome, structure of Ribosome: Translational factors: Initiation, Elongation and Termination of polypeptide.
Regulation of Gene Expression: Gene Expression, Attenuation, anti–attenuation, Anti– sense RNA, Operon Concept, Inducible versus Repressible regulation, Negative vs Positive Control, Translational Regulation.

- **Biomembrane & Cell Architecture: Plasma Membrane**

Lipid Bilayer and Membrane assembly, Membrane carbohydrates, phospholipids and asymmetric organization GPI–anchored proteins and their dynamism, Membrane transport of small molecules. Membrane transport of macromolecules, Exocytosis, Endocytosis (Fluid phase, Receptor–mediated) and Transcytosis. ATP

- **Membrane Traffic and Sorting events:**

Comarttmentalization of higher cells, Nuclear export and import of Proteins, Mitochondrial export and import of proteins, Signal Hypothesis, Secretory–Endocytic Vesicular Path (ER–Golgi–Lysosome) and Secretory vesicles, Co–translational and Post– translational Protein Modification (Oligosaccharides, lipid)
Nuclear Organisation: Chromosomal DNA, Nucleosome, Chromosomal replication and processing.
Control of Gene Expression: Strategies of Gene Control, Pre–transcriptional control, Basic genetic mechanisms in cell differentiation, Post–transcriptional controls.
Cell Signaling: Neurcrine Paracrine and synaptic strategies, Chemical Signaling: Signal mediated by intracellular receptors and surface–receptor–mediated transduction (PI– glycans, DAG, Ca++ G–Proteins)
G–Protein Coupled Receptors: Functional Classification Activator or Inhibitor of Adenylyl Cyclase, Regulation of ion–channels, PI–PLC activation.
Cell Cycle & Programmed Cell death: Steps in Cell Cycle, Yeast as Model system, east odc. Genes for Social Control of Cells. Mechanisms of cell division (Cyclins); Apoptosis.
Molecular Genetics of Cancer: Cancer, Classification, Cancer development, Genetic basis of cancer, DNA–Miroarray analytics of Cancer cells. Retroviruses in cancer, Proto– oncogenes, Oncogenes. Role of Carcinogens and DNA Repair an Cancer. Telomerase.
ATP–Powered Pumps and Intracellular ionic Environment: Muscle Ca++ ATPAse, Na+ –K+ Pump, V Class H+ ATPases, Bacterial ABC Proteins, Eukayotic ABC Pumps.

- **MICROBIOLOGY AND IMMUNOLOGY**

Biology of Microbes: Classification of bacteria, Bacterial cell wall biosynthesis and action of antibiotics, Nutrition physiology and growth characteristics of bacteria, Protozoa, special Features of bacterial metabolism.
Microbial Genetics: Gene transfers in bacteria, Microbial fermentation: Antibiotics, organic acids, and vitamins, Microbial transformations.
Microbes in Decomposition and Recycling Processes: Symbiotic and non–symbiotic, Nitrogen Fixation, Microbiology of water, air, soil and sewage, Food–borne infections. Microbial leaching of minerals, applications of microbes in industry, agriculture and environment.
Viruses: General Properties and Classification, Replication, Retroviruses and Reverse, Transcriptase, Interferons, Bacteriophages.
Immune Response: Specific and Non–Specific immune responses. Humoral versus Cell–mediated immunity.
Immunological memory: Antigens, Haptens, Abjuvants, Lymphokines.
Immunoglobulins: Structure, properties and functional significance, Different Classes.
Antigen–Antibody Interaction: Agglutination, Opsonization, precipitation, neutralization.
Immunological Techniques: Gel Diffusion, Immunodiffusion, RIA, ELISA Ouchterlonny, Immunoblotting, Immunelectronmicroscopy.
Delayed/Immediate Hypersensitivity Reactions: HLAs (MHCs), Auto–antibody, alternate versus Classical paths of complement activation, Surface antigens. Transplantation antigens, HLAs, MHCs T Cell Receptor Biology, Natural Killer cells, Perforins, Interleukins.

- **Biosynthesis of Immunoglobulins and Mechanisms of Antibody Diversity:**

Clonal selection hypothesis, Epitopes and Monclonal antibodies, Hybridoma Technology, Idiotypes and Idiotypes.
Vaccines: Immunization, Protective efficacy of some vaccines, Synthetic vaccine desire.

- **BIOCHEMISTRY OF ENVIRONMENT, HEALTH AND DISEASE, BIOSTATISTICS AND BIOINFORMATICS**

Biochemistry of Health and Disease Meaning and scope of health versus disease
Integration of metabolism: General principles of organ interrelationships.

- **Role of Nutrition in maintenance of health:**

Elements of Nutrition: The fuels used by the body. Body composition. Energy Requirements Basal Metabolic requirements, activity, growth. Role of various dietary carbohydrates, proteins and fat in maintenance of health.
Requirements for vitamins, minerals, water and electrolytes in maintenance of body functioning. Recommended Dietary Allowances.
Assessment and methods of identification of nutritional problems. Techniques of dietary survey, anthropometric, biochemical, clinical and radiological techniques, limitation and interpretation.
Biochemistry of starvation: Alternate methods of energy generation, organ interrelationships during starvation, acid–base balance, ketosis.
Lipid metabolism: Metabolism of chylomicrons, VLDL and IDL, HDL, LDL.
Formation of atherosclerotic plaque. Effects of dietary and other factors. Adipose tissue metabolism: White and brown adipose tissue. Lipolysis, re–esterification.
Lipoprotein lipase.
Alcohol Metabolism: As a source of energy. Fatty liver and cirrhosis.
Biochemistry of aging: Theories General features and molecular details of aging. Role of Free radicals in aging, Antioxidants as scavengers.

- **Biochemistry of stress.**
- **BIOSTATISTICS AND BIOINFORMATICS**

Statistical analysis of Biochemical data: Measures of central tendency, Standard deviation, Variance, Correlation and regression, Basic probability theory Distribution– normal, binomial, students' t–test, ANOVA.
Introduction to commercial computer softwares and their uses in biochemical education.
Introduction to Bioinformatics: Biological Databases, Search and analysis Genomics: Physical Gene Mapping, Sequencing Technology Proteomics: Protein Folding, Structure– Function relationship.

9. CENTRE OF BIOINFORMATICS

The Centre of Bioinformatics was inaugurated in 2002. The Centre offers 4-semester (2 years) M.Sc. Program in Bioinformatics. Master in Bioinformatics program is quite unique; it is rigorous with its credit-based courses covering latest areas in Bioinformatics and Computational Biology. Specifically, beneficial to the students from both Mathematics and Biological sciences streams, it is aimed at transforming students into trained Bioinformaticians with adequate theoretical and practical knowledge for investigating and addressing a number of key biological questions.

To improve the teaching and easy understanding of subjects for the students, center promotes the use of ICT i.e. teaching through projector and online available scientific animations/ tutorials.

🛠 RESEARCH DOMAINS OFFERED AT THE CENTRE

Translational Bioinformatics, System Biology, Clinical data analytics.

🕮 SYLLABUS FOR CRET LEVEL-1 IN BIOINFORMATICS

Carbohydrates: monosaccharides, oligosaccharides polysaccharides, proteoglycans and glycoproteins; Lipids; fatty acids, acylglycerols; phospholipids, sphingolipids, cholesterol and their biological importance.

Proteins: amino acids and peptides; protein structure, function and evolutionary relationships; protein-protein interactions; protein folding.

Nucleic acid: bases, nucleotides, RNA and DNA, different structural forms of DNA; denaturation, renaturation and hybridization of DNA; Protein and Nucleic Acid Electrophoresis techniques.

Enzymes: Nomenclature and classification; units of enzyme activity; coenzymes and metal cofactors; temperature and pH effects; Michaelis-Menten kinetics, inhibitors and activators; active site and catalytic mechanisms; Isoenzymes; Metabolic systems multienzyme complexes and multifunctional enzymes; Oxidation of glucose in cells; high energy bond, glycolysis, citric acid cycle and oxidative phosphorylation.

- **BIO-STATISTICS**

Calculus; Limits, Complete Differentials, Partial differentials of function, Integration: Definite and nondefinite integral, Logarithms, Ordinary differential equations (first order), Partial differential equations-example from biology, Vector-Addition, subtraction, dot cross, scalar triple product, divergence, curl of a vector, equation of normal; Matrix algebra: Addition, subtraction, multiplication, transpose inverse, and conjugate of matrix, Boolean logic; Additional subtraction, multiplication and division using binary, octal and hexadecimal systems, introduction to principles of statistical sampling from a population. Random sampling; Frequency distributions and associated statistical measures; Probability Distribution; Correlation and regression analysis; Multivariate analysis: Hypothesis testing; Markov Models; Cluster Analysis - Nearest neighbour search, Search using stem numbers, Search using text signatures;

- **BIOLOGICAL DATABASES &DATA MINING**

Data warehousing, data capture, data analysis, Introduction to Nucleic Acid and Protein Sequence Data Banks: Nucleic acid sequence data banks: Genbank, EMBL nucleotide sequence data bank, AIDS Virus sequence data bank, rRNA data bank, Protein sequence data banks; NBRF-PIR, SWISSPROT, Signal peptide data bank; Database Similarity Searches; BLAST, FASTA, PSI-BLAST algorithms: Pair wise sequence alignment

NEEDLEMAN and Wunsch, Smith Waterman algorithms; Multiple sequence alignments - CLUSTAL

PRAS: Patterns motifs and Profiles in sequences: Derivation and searching; Derived Databases of patterns, motifs and profiles: Prosite, Blocks, Prints-S, Pfam etc.; Primer Design.

- **SEQUENCE ANALYSIS**

Analysis of protein and nucleic acid sequences, multiple alignment programs, NGS EST Data analysisUse of Molecular Package(s), programs of calculate potential energy of regular structures and their visualization. Use of curve, NUPARM, NEW helix etc. Molecular Phylogeny Models of sequence evolution and phylogenetic methods.

- **MOLECULAR MODELLING**

Concepts of Molecular Modeling. Molecular structure and internal energy, Application of molecular graphics. Energy minimization of small molecules, Empirical representation of molecular energies. Use of Force Fields and MM methods. Local and global energy minima. Techniques in MD and Monte Carlo. Simulation for conformational analysis ***Ab initio,*** DFT and semi-empirical methods, Design of ligands, Drug-receptor interactions. Classical SAR/QSAR, 2D and 3D data searching. Protein quaternary structure modeling. Interaction networks and systems biology.

- **GENOMICS AND PROTEOMICS**

Genomics - Genome sequencing technology. Whole genome analysis, Comparative genomics - Paralogs and orthologs, Phylogenetic profiling. Pathway analysis, Repeat analysis, Human genetic disorders, Candidate gene identification, Linkage analysis, Genotyping analysis, Concepts of Pharmacogenomics Proteomics - Introduction to basic Proteomics technology, Bio-informatics in Proteomics. Gene to Protein Function: a Roundtrip, Analysis of Proteomes. Analysis of 2-D gels. Protein to Disease and Vice Versa, Human Genome and science after Genome era. PCR Technique.

Pharmacogenomics and its application. SNPs and their applications. Proteomics in medicine and its application. Patenting and data generation from patent literature for commercial benefits. IPR and bioinformatics. Bioinformatics patents.

- **MICROARRAY TECHNOLOGY:**

Introduction to basic microarray technology, Bioinformatics in microarrays. Getting started - target selection, Customized microarray design, Image processing and quantification. Normalization and filtering. Exploratory statistical analysis. Public Microarray data resources.

- **COMPUTER AIDED DRUG DESIGNING:**

Structure based drug designing ligand based drug designing pharamocohore generation & modeling Docking methodologies QSAR &3D QSAR.

- **BIOLOGICAL NETWORKS & SYSTEMS BIOLOGY**

Introduction to Network, Types of networks (small world, random, scale-free networks, and Hierarchical networks), Introduction to biological networks, Importance of biological networks, Types of biological networks, Network parameters: Node degree, Node degree distribution, Scale-free networks and the degree exponent, Shortest path, Mean path length, Clustering coefficient, Node centrality and network' centrality, Sub-graphs, Motifs, Motif clusters, and Modules, Gene Regulatory network, Protein-Protein interactions, Computational Prediction of Protein-Protein interactions, Introduction to systems biology.

- **COMPUTER AND PROGRAMMING LANGUAGES**

Block diagram of computer, Boolean algebra, logic gates, Linux OS, compilers, interpreters, Algorithms and flowcharts. Parallel Computing. Programming in Perl, Java, MySQL & MatLab (Directories, subroutines, references, packages, libraries, modules, classes, objects, file handling).

10. CENTRE OF BIOTECHNOLOGY

Department of Botany is a well-known department of University of Allahabad. The Department which was earlier a part of Biology Department of Muir Central College started as a separate entity in the year 1923, with Dr. J.H Mitter as the founder Head of the Department. In recognition of its academic excellence, the department of botany was awarded two prestigious programs by the UGC 1- The special assistance program (1976) 2- The COSIST support program (1990).

Roxburgh botanical garden and Experimental farm- The department is maintaining perhaps the best botanical garden in the country which is famous for the rich collection of rare Pteridophytes, Gymnosperms and Angiosperms. It is maintaining the best collection of rare Cycads and Conifers. Agharkar Museum- The department has a Botanical Museum which is located on the first floor of east wing of the botany department. The museum is well known for its rare collection of living and fossil plant belonging to different plant groups from Algae to Angiosperm. Duthie Herbarium- The department is maintaining the best collection of herbarium plants of various groups like Bryophytes, Pteridophytes, Gymnosperms and Angiosperms. It includes the rare prized collection of Duthie, King, Kustler, Dudgeon, Cave, Wallich and Gamble. There are nearly 25000 specimens. Central Instrumentation laboratory- Department has central instrument facility (CIL) equipped with AAS, UV-Vis spectrophotometer, HPLC, High Speed Refrigerated Centrifuge and MilliQ water purification system. Departmental Library-The Departmental Library contains about 13,000 books on Botany and 250 books on Environmental Science.

🛠 RESEARCH DOMAINS OFFERED AT THE CENTRE

Palaeobotany, Morphology and Anatomy, Plant Pathology including Microbiology, Plant Physiology and other areas of interest like Taxonomy, Bio-diversity, Palynology, Ecology, Cytogenetics and molecular Biology which are also attaining excellence.

🕮 SYLLABUS FOR CRET LEVEL-1 IN BIOTECHNOLOGY

- **MOLECULES AND THEIR INTERACTION RELAVENT TO BIOLOGY**

Structure of atoms, molecules and chemical bonds.
Composition, structure and function of biomolecules (carbohydrates, lipids, proteins, nucleic acids and vitamins).
Stabilizing interactions (Van der Waals, electrostatic, hydrogen bonding, hydrophobic interaction etc.)
Principles of biophysical chemistry (pH, buffer, reaction kinetics, thermodynamics, colligative properties)
Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.
Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes.
Conformation of proteins (Ramachandran plot, secondary, tertiary and quaternary structure; domains; motif and folds).
Conformation of nucleic acids (A–, B–, Z–, DNA), t–RNA, micro–RNA).
Stability of protein and nucleic acid structures.
Metabolism of carbohydrates, lipids, amino acids, nucleotides and vitamins.

- **CELLULAR ORGANIZATION**

Membrane structure and function: Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.

Structural organization and function of intracellular organelles: Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, peroxisomes, plastids, vocuoles, chloroplast, structure & function of cytoskeleton and its role in motility.
Organization of genes and chromosomes: Operon, interrupted genes, gene families, structure of chromatin and chromosomes, unique and repetitive DNA, heterochromatin, euchromatin, transposons.
Cell division and cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.
Microbial Physiology: Growth, yield and characteristics, strategies of cell division, stress response.

- **FUNDAMENTAL PROCESSES**

DNA replication, repair and recombination: Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms.
RNA synthesis and processing: Transcription factors and machinery, formation of initiation complex, transcription activators and repressors, RNA polymerases, capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure and function of different types of RNA, RNA transport.
Protein synthesis and processing: Ribosome, formation of initiation complex initiation factors and their regulation, elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNA identity, aminoacyl tRNA synthetase, translational proof– reading translational inhibitors, post–translational modification of proteins.
Control of gene expression at transcription and translation level: Regulation of phages, viruses, prokaryotic and eukaryotic gene expression, role of chromatin in regulating gene expression and gene silencing.

- **CELL COMMUNICATION AND CELL SIGNALING**

Host parasite Interaction: Recognition and entry processes of different pathogens like bacteria, viruses into animal and plant host cells; alteration of host cell behaviour by pathogens, virus–induced cell transformation, pathogen–induced diseases, in animals and plants, cell–cell fusion in both normal and abnormal cells.
Cell signaling: Hormones and their receptors, cell surface receptor, signaling through G– protein coupled receptors, signal transduction pathways, second messengers, regulation of signaling pathways, bacterial and plant two–component signaling systems, bacterial chemotaxis and quorum sensing.
Cellular communication: Regulations of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation.
Cancer: Genetic rearrangements in progenitor, tumor suppressor genes, cancer and the cell cycle, virus–induced cancer, metastasis, interaction of cancer cells with normal cells, apoptosis, therapeutic interventions of uncontrolled cell growth.
Innate and adaptive immune system: Cells and molecules involved in innate and adaptive immunity, antigens, antigenicity and immunogenicity. B and T cell epitopes, structure and function of antibody molecules, generation of antibody diversity, monoclonal antibodies, antibody engineering, antigen–antibody interactions, MHC molecules, antigen processing and presentation, activation and differentiation of B and T cells, B and T cell receptors, humoral and cell–mediated immune responses, primary and secondary immune modulation, the complement
system, Toll–like receptors, cell–mediated effector functions, inflammation, hypersensitivity and autoimmunity, immune response during bacterial (tuberculosis), parasitic (malaria) and viral (HIV) infections, congential and acquired immunodeficiencies, vaccines.

- **DEVELOPMENT BIOLOGY**

Basic concepts of development: Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplasmic determinants; imprinting; mutants and transgenics in analysis of development.
Gametogenesis, fertilization and early development: Production of gametes, cell surface molecules in sperm–egg recognition in animals; embryo sac development and double fertilization in plants; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in

animals; embryogenesis, establishment of symmetry in plants; seed formation and germination.
Morphogenesis and organogenesis in animals: Cell aggregation and differentiation in *Dictyostelium;* axes and pattern formation in *Drosophila*, amphibia and chich; organogenesis – vulva formation in *Caenorhabditis elegans;* eye lens induction, limb development and regeneration in vertebrates; differentiation of neurons, post embryonic development–larval formation, metamorphosis; environmental regulation of normal development; sex determination.
Morphogenesis and organogenesis in plants: Organization of shoot and root apical meristem; shoot and root development; leaf development and phyllotaxy; transition to flowering, floral meristems and floral development in *Arabidopsis* and *Antirrhinum*.
Programmed cell death, aging and senescence.

- **SYSTEM PHYSIOLOGY – PLANT**

Photosynthesis: Light harvesting complexes; mechanisms of electron transport; photoprotective mechanisms; CO_2 fixation–C_3, C_4 and CAM pathways.
Respiration and photorespiration: Citric acid cycle; plant mitochondrial electron transport and ATP synthesis; alternate oxidase; photorespiratory pathway.
Nitrogen metabolism: Nitrate and ammonium assimilation; amino acid biosynthesis.
Plant hormones: Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action.
Sensory photobiology: Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins; stomatal movement; photoperiodism and biological clocks.
Solute transport and photoassimilate translocation: Uptake, transport and translocation of water, ions, solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem; transpiration; mechanisms of loading and unloading of photoassimilates.
Secondary metabolites: Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.
Stress Physiology: Responses of plants to biotic (pathogen and insects) and abiotic (water, temperature and salt) stresses; mechanisms of resistance to biotic stress and tolerance to abiotic stress.

- **SYSTEM PHYSIOLOGY – ANIMAL**

Blood and circulation: Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostatis.
Cardiovascular system: Comparative anatomy of heart structure, myogenic heart, specialized tissue, ECG – its principle and significance, cardiac cycle, ehart as a pump, blood pressure, neural and chemical regulation of all above.
Respiratory system: Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.
Nervous system: Neurons, action potential, gross neuroanatomy of the brain and spinal cord, central and peripheral nervous system, neural control of muscle tone and posture.
Sense organs: Vision, hearing and tactile response.
Excretory system: Comparative physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition, regulation of water balance, blood volume, blood pressure, electrolyte balance, acid base balance.
Thermoregulation: Comfort zone, body temperature – physical, chemical, neural regulation, acclimatization.
Stress and adaptation.
Digestive system: Digestion, absorption, energy balance, BMR.
Endocrinology and reproduction: Endocrine glands, basic mechanism of hormone action, hormones and diseases; reproductive processes, neuroendocrine regulation.

- **INHERITANCE BIOLOGY**

Mendelian Principles: Dominance, segregation, independent assortment, deviation from Mendelian inheritance.
Concept of gene: Allele, multiple alleles, pseudoallele, complementation tests.
Extension of Mendelian principles: Codominance, Incomplete dominance, gene interactions, pleiotropy, genomic imprinting penetrance and expressivity phenocopy, linkage and crossing over, sex linkage, sex limited and sex influenced characters.
Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by

using somatic cell hybrids, development of mapping population in plants.
Extra chromosomal Inheritance: Inheritance of mitochondrial and chloroplast genes, maternal inheritance.
Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and sex–duction, mapping genes by interrupted mating, fine structure analysis of genes.
Human genetics: Pedigree analysis lod score for linkage testing, karyotypes, genetic disorders.
Quantitative genetics: Polygenic inheritance, heritability and its measurements, QTL mapping.
Mutation: Types, causes and detection, mutant types – lethan, conditional, biochemical, loss of function, gain of function, germinal implications.
Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications.
Recombination: Homologous and non–homologous recombination, including transposition, site– specific recombination.

- **DIVERSITY OF LIFE FORMS**

Principles and methods of taxonomy: Concepts of species and hierarchical taxa, biological nomenclature, classical and quantitative methods of taxonomy of plants, animals and microorganisms.
Levels of structural organization: Unicellular, colonial and mutlicellcular forms; levels of organization of tissues, organs and systems; comparative anatomy.
Outline classification of plants, animals and microorganisms:
Important criteria used for classification in each taxon; classification of plants, animals and microorganisms; evolutionary relationships among taxa.
Natural history of Indian subcontinent: Major habitat of the subcontinent, geographic origins and migration of species; common Indian mammals, birds; seasonality and phenology of the subcontinent.
Organisms of health and agricultural Importance: Common parasites and pathogens of humans, domestic animals and crops.

- **ECOLOGICAL PRINCIPLES**

The Environment: Physical environment; biotic environment; biotic and abiotic interactions.
Habitat and niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource portioning; character displacement.
Population ecology: Characteristics of a population growth curves; population regulation; life history strategies (*r* and *K* selection); concept of metapopulation – demes and dispersal, interdemic extinctions, age structured populations.
Species Interactions: Type of interactions, interspecific competition, herbivory, camivory, pollination, symbiosis.
Community ecology: Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.
Ecological succession: Types; mechanisms; changes involved in succession; concept of climax.
Ecosystem: Structure and function; energy flow and mineral cycling (CNP); primary production and decomposition; structure and function of some Indian ecosystems (forest, grassland) and aquatic (fresh water, marine eustarine).
Biogeography: Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.
Applied ecology: Environmental pollution; global environmental change; biodiversity–status, monitoring and documentation; major drives of biodiversity change; biodiversity management approaches.
Conservation biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).

- **EVOLUTION AND BEHAVIOUR**

Emergence and evolutionary thoughts: Lamarck; Darwin–concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; spontaneity of mutations; the evolutionary synthesis.
Origin of cells and unicellular evolution: Origin of basic biological molecules; abiotic synthesis of organic monomers and polymers; concept of Oparin and Haldane; experiment of Miller (1953); the first cell; evolution of prokaryotes; origin of eukaryotic cells; evolution of unicellular eukaryotes; anaerobic metabolism, photosynthesis and aerobic metabolism.
Paleontology and evolutionary history: The evolutionary time scale; eras, periods and epoch; major events in the evolutionary time scale; origins of unicellular and multicellular organisms; major groups of

plants and animals; stages in primate evolution including Homo.

Molecular Evolution: Concepts of neural evolution, molecular divergence and molecular clocks; molecular tools in phylogeny, classification and identification; protein and nucleotide sequence analysis; origin of new genes and proteins; gene duplication and divergence.

The Mechanism: Population genetics – populations, gene pool, gene frequency; Hardy– Weinberg law; concepts and rate of change in gene frequency through natural selections, migration and random genetic drift; adaptive radiation and modifications; isolating mechanisms; speciation; allopatricity and sympatricity; convergent evolution; sexual selection; co–evolution.

Brain, Behavior and Evolution: Approaches and methods in study of behavior, proximate and ultimate causation, altruism and evolution–group selection, kin selection, reciprocal altruism; neural basis of learning, memory, cognition, sleep and arousal; biological clocks; development of behavior; social communication; social dominance; use of space and territoriality; mating systems, parental investment and reproductivesuc cess; parental care; aggressive behavior habitat selection and optimality in foraging; migration, orientation and navigation; domestication and behavioral changes.

- **APPLIED BIOLOGY:**

Microbial fermentation and production of small and macro molecules.

Application of immunological principles (vaccines, diagnostics), tissue and cell culture methods for plants and animals.

Transgenic animals and plants, molecular approaches to diagnosis and strain identification.

Genomics and its application to health and agriculture, including gene therapy.

Bioresource and uses of biodiversity.

Breeding in plants and animals, including marker – assisted selection.

Bioremediation and phytoremediation.

Biosensors.

- **METHODS IN BIOLOGY**

Molecular biology and recombinant DNA methods: Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, different separation methods; analysis of RNA, DNA and proteins by one and two dimensional gel electrophyoresis, isoelectric focusing gels; molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems; expression of recombinant proteins using bacterial, animal and plant vectors; isolation of specific nucleic acid sequences; generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors; in vitro mutagenesis and deletion techniques, gene knock out in bacterial and eukaryotic organisms; protein sequencing methods, detection of post–translation modification of proteins; DNA sequencing methods, strategies for genome sequencing; methods of analysis of gene expression at RNA and protein level, large scale expression analysis, such as micro array based techniques; isolation, separation and analysis of carbohydrate and lipid molecules; RFLP, RAPD and AFLP techniques.

Histochemical and Immunotechniques: Antibody generation, detection of molecules using ELISA, RIA, western blot, immunoprecipitation, floweytometry and immunofluorescence microscopy, detection of molecules in living cells, *in situ* locatization by techniques such as FISH and GISH.

Biophysical methods: Analysis of biomolecules using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy, structure determination using X–ray diffraction and NMR; analysis using light scattering, different types of mass spectrometry and surface plasma resonance methods.

Statistical Methods: Measures of central tendency and dispersal; probability distribution (Binomial, Poisson and normal); sampling distribution; difference between parametric and non– parametric statistics; confidence interval; errors; levels of significance; regression and correlation; t–test; analysis of variance; X2 test; basic introduction to Muetrovariate statistics, etc.

Radiolabeling techniques: Properties of different types of radioisotopes normally used in biology, their detection and measurement; incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material safety guidelines.

Microscopic techniques: Visualization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining techniques for EM, freeze–etch and freeze–fracture methods for EM, image processing methods in microscopy.

Electrophysiological methods: Single neuron recording, patch–clamp recording, ECG, Brain activity recording, lesion and stimulation of brain, pharmacological testing, PET, MRI, fMRI, CAT.

Methods in field biology: Methods of estimating population density of animals and plants, ranging patterns

through direct, indirect and remote observations, sampling methods in the study of behavior, habitat characterization–groundand remote sensing methods.

Computational methods: Nucleic acid and protein sequence databases; data methods for sequence analysis, web–based tools for sequence searches, motif analysis and presentation.

11. DEPARTMENT OF BOTANY

Department of Botany is a well-known department of University of Allahabad. The Department which was earlier a part of Biology Department of Muir Central College started as a separate entity in the year 1923, with Dr. J.H Mitter as the founder Head of the Department. In recognition of its academic excellence, the department of botany was awarded two prestigious programs by the UGC 1- The special assistance program (1976) 2- The COSIST support program (1990). The department is maintaining perhaps the best botanical garden in the country which is famous for the rich collection of rare Pteridophytes, Gymnosperms and Angiosperms. It is maintaining the best collection of rare Cycads and Conifers.

The department has a Botanical Museum which is located on the first floor of east wing of the botany department. The museum is well known for its rare collection of living and fossil plant belonging to different plant groups from Algae to Angiosperm. The department is maintaining the best collection of herbarium plants of various groups like Bryophytes, Pteridophytes, Gymnosperms and Angiosperms. It includes the rare prized collection of Duthie, King, Kustler, Dudgeon, Cave, Wallich and Gamble. There are nearly 25000 specimens. Department has central instrument facility (CIL) equipped with AAS, UV-Vis spectrophotometer, HPLC, High Speed Refrigerated Centrifuge and MilliQ water purification system. The Departmental Library contains about 13,000 books on Botany and 250 books on Environmental Science.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Palaeobotany, Morphology and Anatomy, Plant Pathology including Microbiology, Plant Physiology, Taxonomy, Bio-diversity, Palynology, Ecology, Cytogenetics and molecular Biology.

🕮 SYLLABUS FOR CRET LEVEL-1 IN BOTANY

- **MOLECULES AND THEIR INTERACTION RELABENT TO BIOLOGY**

Composition, structure and function of biomolecules (carbohydrates, proteins, nucleic acids and vitamins)
Bioenergetics, glycolysis, oxidative phosphorylation, coupled reaction, group transfer, biological energy transducers.
Principles of catalysis, enzymes and enzyme kinetics, enzyme regulation, mechanism of enzyme catalysis, isozymes.
Conformation of nucleic acids (A-B-Z-DNA), t-RNA, micro-RNA).
Stability of protein and nucleic acid structures.
Metabolism of carbohydrates, lipids, amino acids, nucleotides and vitamins.

- **CELLULAR ORGANIZATION**

Membrane structure and function: Structure of model membrane, lipid bilayer and membrane protein diffusion, osmosis, ion channels, active transport, ion pumps, mechanism of sorting and regulation of intracellular transport, electrical properties of membranes.
Structural organization and function of intracellular organelles: Cell wall, nucleus, mitochondria, Golgi bodies, lysosomes, endoplasmic reticulum, eroxisomes, plastids, vacuoles, chloroplast, structure & function of cytoskeleton and its role in motility.
Organization of genes and chromosomes: Operon, interrupted genes, gene families, structure of chromatin and chromosomes, unique and repetitive DNA, heterochromatin, euchromatin, transposons.
Cell division and cell cycle: Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.

Microbial Physiology: Growth, yield and characteristics, strategies of cell division, stress response.

- **FUNDAMENTAL PROCESSES**

DNA replication, repair and recombination: Unit of replication, enzymes involved, replication origin and replication fork, fidelity of replication, extrachromosomal replicons, DNA damage and repair mechanisms.

RNA synthesis and processing: Transcription factors and machinery, formation of initiation complex. Transcription activators and repressers, RNA polymerases, capping, elongation and termination, RNA processing, RNA editing, splicing, polyadenylation, structure and function of different types of RNA, RNA transport.

Protein synthesis and processing: Ribosome, formation of initiation complex, initiation factors and their regulation, elongation and elongation and elongation factors, termination, genetic code, aminoacylation of tRNA, tRNAidentity, aminoacyl tRNA synthetase, translational proof-reading, translational inhibitors, post-translational modification of proteins.

Control of gene expression at transcription and translation level: Regulation of phages, viruses, prokaryotic and eukaryotic gene expression, role of chromatin in regulating gene expression and gene silencing.

- **CELL COMMUNICATION AND CELL SIGNALING**

Host parasite interaction: Recognition and entry processes of different pathogens like bacteria, viruses into animal and plant host cells, alteration of host cell behavior by pathogens, virus-induced cell transformation, pathogen-induced diseases in animals and plants, cell-cell fusion in both normal and abnormal cells.

Innate and adaptive immune system: Cells and molecules involved in innate and adaptive immunity, antigens, antigenicity and immunogenicity, B and T cell epitopes, structure and function of antibody molecules, generation of antibody diversity, monoclonal antibodies, antibody engineering, antigenantibody interaction, MHC molecules, antigen processing and presentation, activation and differentiation of B and T Cells, B and T cell receptors, humoral and cell-mediated immune responses, primary and secondary immune modulation, the complement system. Toll-like receptors, cellmediated effector functions, inflammation, hypersensitivity and autoimmunity, immune response during bacterial (tuberculosis), parasitic (Malaria) and viral (HIV) infections, congenital and acquired immunodeficiencies, vaccines.

- **DEVELOPMENTAL BIOLOGY**

Basic concepts of development: Potency, commitment, specification, induction, competence, determination and differentiation, morphogenetic gradients, cell fate and cell lineages, stem cells genomic equivatence and the cytoplasmic determinants, imprinting, mutants and transgenics in analysis of development.

Gametogenesis, fertilization and early development: Production of gametes, embryo sac development and double fertilization in plants; zygote formation, embryogenesis, establishment of symmetry in plants, sees formation and germination.

Morphogenesis and organogenesis in plants: Organization of shoot and root apical meristem, shoot and root development, leaf development and phyllotaxy, transition to flowering, floral meristems and floral development in **Arabidopsis** and **Antirrhinum**.

Programmed cell death, aging and senescence.

- **SYSTEM PHYSIOLOGY PLANT**

Photosynthesis: Light harvesting complexes, mechanisms of electron transport, photoprotective mechanisms, CO2 fixation-C3, C4 and CAM pathways.

Respiration and photorespiration**:** Citric acid cycle, plant mitochondrial electron transport and ATP synthesis, alternate oxidase photorespiratory pathway.

Nitrogen Metabolism**:** Nitrate and ammonium assimilation, amino acid biosynthesis.

Plant hormones**:** Biosynthesis, storage, breakdown and transport, physiological effects and mechanisms of action.

Sensory photobiology: Structure, function and mechanisms of action of phytochromes, cryptochromes and phototropins, stomatal movement, photoperiodism and biological clocks.

Solute **transport and photoassimilate translocation:** Uptake, transport and translocation of water, ions

solutes and macromolecules from soil, through cells, across membranes, through xylem and phloem, transpiration, mechanisms of loading and unloading of photoassimilates.
Secondary metabolites: biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.
Stress physiology: Responses of plants to biotic (pathogen and insects) and abiotic (water temperature and salt) stresses, mechanisms of resistance to biotic stress and tolerance to abiotic stress.

- **INHERITANCE BIOLOGY**

Mendelian principles: Dominance, segregation, independent assortment, deviation from Mehdelian inheritance.
Concept of gene: Allele, multiple alleles, pseudoallele, complementation tests.
Extensions of Mendelian principles: Codominance, incomplete dominance, gene interactions, pleiotropy genomic imprinting penetrance and expressivity, phenocopy, linkage and crossing over sex linkage sex limited and sex influenced characters.
Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.
Extra chromosomal inheritance: Inheritance of mitochondrial and chloroplast genes, maternal inheritance.
Microbial genetics: Methods of genetic transfers-transformation, conjugation, transduction and sex-duction, mapping genes by interrupted mating, fine structure analysis of genes.
Quantitative **genetics:** Polygenic inheritance, heritability and its measurements, QTl mapping.
Mutation: Types, causes and detection, mutant types-lethal, conditional, biochemical, loss of function, gain of function, germinal verses somatic mutants, insertional mutagenesis.
Structural and numerical alterations of chromosomes: Deletion, deplication, inversion, translocation, ploidy and their genetic implications.
Recombination: Homologous and non-homologous recombination, including transposition, site-specific recombination.

- **DIVERSITY OF LIFE FORMS**

Principles and methods**:** of taxonomy, concepts of species and hierarchical taxa, biological nomenclature, classical and quantititative methods of taxonomy of plants and microorganisms.
Levels of structural organization: Unicellular colonial and multicellular forms, levels of organization of tissues, organs and systems, comparative anatomy.
Outline classification of plants and microorganisms: Important criteria used for classification in each taxon, classification of plants and microorganisms, evolutionary relationships among taxa.
Natural history of Indian subcontinent: Major habitat types of the subcontinent, geographic origins and migrations of species.

- **ECOLOGICAL PRINCIPLES**

The environment: Physical environment, biotic environment, biotic and abiotic interactions.
Habitat **and niche:** Concept of habitat and niche, niche width and overlap, fundamental and realized niche, resource partitioning, character displacement.
Population ecology: Characteristics of population, population growth curves, population regulation, life history strategies (r and K selection), concept of metapopulation-demes and dispersal, interdemic extinctions, age structured populations.
Species interactions: Types of interactions, interspecific competition, herbivory, carnvory, pollination, symbiosis.
Community ecology: Nature of communities, community structure and attributes, levels of species diversity and its measurement, edges and ecotones.
Ecological succession: Types, mechanisms, changes involved in succession, concept of climax.
Ecosystem: Structure and function, energy flow and mineral cycling (CNP) primary production and decomposition, structure and function of some Indian ecosystems, terrestrial (forest, grassland) and aquatic (fresh water, marine, estuarine).
Biogeography**:** Major terrestrial biomes, theory of island biogeography, biogeographical zones of India.
Applied ecology: Environmental pollution, global environmental change, biodiversity-status, monitoring and documentation, major drivers of biodiversity change, biodiversity management approaches.
Conservation biology: Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).

- **EVOLUTION AND BEHAVIOUR**

Emergence of evolutionary thoughts: Lamarck, Darwin-concepts of variation, adaptation, struggle, fitness and natural selection, Mendelism, spontaneity of mutations, the evolutionary synthesis.
Origin of cells and unicellular evolution: Origin of basic biological molecules, abiotic synthesis of organic monomers and polymers, concept of Oparin and Haldane, experiment of Miller (1953),the first cell evolution of prokaryotes, origin of eukaryotic cells evolution of unicellular eukaryotes, anaerobic metabolism, photosynthesis and aerobic metabolism.
Paleontology and evolutionary history: The evolutionary time scale, eras, periods and epoch, major events in the evolutionary time scale, origins of unicellular and multicellular organisms, major groups of plants and animals, stages in primate evolution including Homo.
Molecular Evolution**:** concepts of neutral evolution, molecular divergence and molecular clocks, molecular tools in phylogeny, classification and identification, protein and nucleotide sequence analysis, origin of new genes and proteins, gene duplication and divergence.
The Mechanisms: Population genetics-populations genepool, gene frequency, Hardy- Weinberg law, concepts and rate of change in gene frequency through natural selection, migration and random genetic drift, adaptive radiation and modifications, isolating mechanisms, speciation, allopatricity & sympatricity, convergent evolution, sexual selection, co-evolution.

- **APPLIED BIOLOGY**

Microbial fermentation and production of small and macro molecules.
Application of immunological principles (vaccines, diagnostics), tissue and cell culture methods for plants and animals.
Transgenic plants, molecular approaches to diagnosis & strain identification.
Genomics & its application to health and agriculture, including gene therapy.
Bioresource and uses of biodiversity.
Breeding in plants.
Bioremediation and phytoremediation.
Biosensors.

- **METHODS IN BIOLOGY**

Molecular biology and recombinant DNA methods: Isolation and purification of RNA, DNA (genomic and plasmid) and proteins, different separation methods, analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, isoelectric focusing gels, molecular
cloning of DNA or RNA fragments in bacterial and eukaryotic systems, expression of recombinant proteins using bacterial, animal and plant vectors, isolation of specific nucleic acid sequences, generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAG and YAC vectors, in vitro mutagenesis and deletion techniques, gene knock out in bacterial and eukaryotic organisms, protein sequencing methods, detection of post-translation modification of proteins, DNA sequencing methods, strategies for genome sequencing, methods for analysis of gene expression at RNA and analysis of carbohydrate and lipid molecules, RFLP, RAPD and AFLP techniques.
Histochemical and immunotechniques: Antibody generation, detection of molecules using ELISA, RIA, western blot, immunoprecipitation, floweytometry and immunofluorescence microscopy, detection of molecules in living cells, localization by techniques such as FISH and GISH.
Biophysical methods: Analysis of biomolecules using UV/visible, fluorescence, circular dichroism, NMR and ESR spectroscopy, structure determination using X-ray diffraction and NMR analysis using light scattering different types of mass spectrometry and surface plasma resonance methods.
Statistical Methods: Measures of central tendency and dispersal, probability distributions (Binomial, Poisson and normal), sampling distribution, difference between parametric and non- parametric statistics, confidence interval, errors, levels of significance, regression and test, basic introduction to 2% correlation, t-test, analysis of variance, Muetrovariate statistics, etc.
Radiolabeling techniques: Properties of different types of radioisotopes normally used in biology, their detection and measurement, incorporation of radioisotopes in biological tissues and cells, molecular imaging of radioactive material, safety guidelines.
Microscopic techniques: Visulization of cells and subcellular components by light microscopy, resolving powers of different microscopes, microscopy of living cells, scanning and transmission microscopes, different fixation and staining technicues for EM freeze-etch and freeze-fracture methods

for EM, image processing methods in microscopy.

Methods in field biology: Methods of estimating population density of plants, ranging patterns through direct, indirect and remote observations, sampling methods in the study of behavior habitat characterization-ground and remote sensing methods.

Computational Methods: Nucleic acid and protein sequence databases, data mining methods for sequence analysis, web-based tools for sequence searches, motif analysis and presentation.

12. DEPARTMENT OF CHEMISTRY

Established in 1921, the Department of Chemistry is one of the oldest, most prominent, and core departments of the Faculty of Science. It has earned significant scientific recognition on the national and international platform under the visionary guidance of Prof. N.R. Dhar (I.E.S.). The Sheila Dhar Institute of Soil Science, founded by him in 1935, is also an integral part of the Department of Chemistry, focusing on Agricultural Chemistry education and research. The Department continues to excel in delivering quality education to nearly 2000 students every year at the undergraduate, postgraduate, and PhD levels and performs cutting-edge research. Presently, thirty-four faculty members with research experience in diverse fields are serving in the emerging fields of chemistry for societal development. The Department has an excellent track record of attracting research funds from various national funding agencies.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Biopolymer, Nanocatalysis, Nanofertilizers, Synthetic Organic Chemistry, Drug Development and Medicinal Chemistry, Chemical Kinetics, Coordination Chemistry, Material Science and Nanotechnology, Green Synthesis of Biodynamic Heterocyclic Scaffold, Soil Chemistry, Energy and Environment, Sensors and Electronic Devices for Medical Diagnosis, Computational Chemistry.

🕮 SYLLABUS FOR CRET LEVEL-1 IN CHEMISTRY

Molecular Symmetry & Spectroscopy: Symmetry elements and operations, Symmetry point groups of molecules. Terms symbols and their determination for gaseous atom/ions. Spin-orbit coupling in free ion terms.

Spectroscopy: Theoretical treatment of rotational, vibrational-rotation, electronic and Raman spectroscopy, Theory of nuclear magnetic resonance, Mossbauer, photoelectron spectroscopy, scanning tunneling microscopy. Applications of electronic, vibrational, UV-VIS, IR, NMR and Raman spectroscopy for structural elucidation of compounds and in analysis.

Electrochemistry and Electroanalytical methods: Electrochemical cell equation, EMF of cells with transference and without transference. Electrode kinetics, electrical double layer, electrode/electrolyte interface, Mechanism of electrode reactions. Overpotential batterics, primary and secondary fuel cells, corrosion and corrosion prevention, Ionselective electrodes, controlled potential electrolysis, voltammetry – polarography, Anodic stripping voltametry, cyclic voltermetry.

Electrochemistry and Polarization: Mechanism of electrode reactions. The current potential relation. The Tafel equation. Butler-Volmer equation, Concept of hydration number, activities in electrolytic solutions; mean ionic activity coefficient; Debye-Huckel treatment of dilute electroyte solutions.

Nuclear Chemistry and Radiochemical Analysis: Stability of nucleus, Nuclear reactions, measurements of nuclear radiations, nuclear energy and nuclear reactors. Neutran activation analysis, dilution analysis, tracer techniques.

Surface Phenomena: Uni and bimolecular surface reactions. Langmuir-Hnishelwood and Langmuir Rideal mechanisms. Inhibition of surface reactions Absolute reaction rate theory of surface reaction.

Chromatographic techniques: Principles, classification and applications of column curomatography, size exclusion chromatography, ion exchange chromatography, gas chromatography and high performance liquid chromatography.

Other Physical Techniques: Principle and applications of TGA, DTA and DSC. Atomic Absorption spectroscopy, Atomic Fluorescence spectroscopy, X-ray Fluoresence Spectroscopy, photoelectron spectroscopy, ESCA, Auger electron spectroscopy and Scanning Tunelling Microscopy (STM).

Kinetic methods of analysis - Enzyme catalyzed reactions and their applications in chemical analysis,

immunoassay.

Data Analysis: Data reduction, accuracy and precision, determinate and indeterminate errors, propagation of errors, confidence interval, rejection of results, least squares analysis, hypothesis testing using statistical analysis.

Intermolecular Forces: Nature of intermolecular forces, Various contribution of intermolecular forces. London theory of dispersion forces. Potential parameters of L-J potentials and evaluation of second virial coefficients.

Ideal and non-ideal solutions: Thermodynamic functions of mixing and excess functions, Partial molar properties of liquid mixtures. Determination of partial molar volume and partial molar enthalpy, Gibbs-Duhem – Margules equation. Thermodynamics of hydrolysis of adenosine triphosphate (ATP). Standard Gibbs free energies of a number of phosphate esters. Binding of oxygen by Myoglobin and Heamoglobin.

Thermodynamics: Second law of thermodynamics, entropy, Gibbs-Helmoholtz equation. Third law of thermodynamics and determination of entropy. Free energy and entropy of mixing, partial molar quantities, Gibbs-Duhem equation. Equilibrium constant, temperature-dependence of equilibrium constant, phase diagram of one and two component systems, phase rule and its thermodynamics derivation.

Statistical Thermodynamics: Thermodynamic probability and entropy; Maxwell- Boltzmann, Bose-Einstein and Fermi-Dirac statistics. Partition function: rotational translational, vibrational, and electronic partition functions for diatomic molecules; calculations of thermodynamic functions and equilibrium constants. Theories of specific heat for solids.

Non-equilibrium Thermodynamics: Postulates and methodologies, liner laws, Gibbs equation, Onsager reciprocal theory. Entropy production and entropy flow.

Reaction Kinetics: Mechanisms of photochemical chain and oscillatory reactions. Collision theory of reaction rates; steric factor, treatment of unimolecular reactions. Theory of absolute reaction rates, comparision of results with Eyring and Arrhenius equations. Ionic reactions: salt effect. Homogeneous catalysis and michaelis-Menten kinetics; heterogeneous catalysis. Luminesence and Energy transfer processes. Study of kinetics by stoppedflow technique, relaxation method, flash photolysis and magnetic resonance method.

Mechanism of Organic Reactions: Labelling and Kinetic isotope, Hamett equation, (sigma-rho) relationship, non-classical carbonium ions, neighbouring group participation.

Inorganic Reaction and Mechanism: Inert and labile complexes. Ligand displacement reactions in octahedral and tetrahedral complexes. Trans effect. Mechanism of electron transfer, isomerisation and recemisation reaction.

Quantum Chemistry: Postulates of quantum mechanics and Schrodinger equation: free particle, particle in a 3-dimentional box, degeneracy, harmonic oscillator, rigid rotator and the hydrogen atom. Angular momentum, including spin; coupling of angular momenta including spin-orbit coupling. The variation method and perturbation theory**:** Application to the helium atom; antisymmetry and Exclusion Principle, Slater determinantal wave functions. Terms symbols and spectroscopic states.Born- Oppenheimer approximation : LCAO-MO and VB treatments of the hydrogen molecule Hydrogen molecule ion, electron density, forces and their role in chemical binding. Huckel pi-electron theory and its applications to ethylene, butadiene and benzene. Idea of self-consistent fields.

Macromolecules: Determination of molecular weights. Kinetics of polymerization. Stereochemistry and mechanism of polymerization.

Solids: Bonding and conduction, Electronic structures of solids, Schottky and Frenkel defects, Electrical properties; Insulators and semiconductors; superconductors; Free electron theory, Fermi- gas theory and band theory of solids, Solid-state reactions.

Pericyclic Reactions: Selection rules and stereochemistry of electrocyclic reactions, cycloaddition reactions and sigmatropic shifts, Cope and Claisen rearrangements.

Common Organic Reactions and Mechanisms: Reactive intermediates, Formation and stability of carbonium ions, carbanians, carbenes, nitrenes, radicals and arynes. Nucleophilic, electrophilic, radical substitutions, addition and elimination reactions. Familiar name reactions: Alodol, Perkin, Stobbe, Dieckmann condensations; Hofmann, Schmidt, Lossen, Curtius, Beckmamm and Fries rearrangment; Reimer – Tiemann, Reformatsky and Grignard reactions. Diels – Alder reactions;
Clasien rearrangement; Friedial – Crafts reaction; Wittig reaction; and Robinson annulation. Routine

functional group transformations and interconversions of simple functionalities. Hydroboration, Oppenaur oxidation; Clemmensen, Wolff-Kishner, Meerwein-Ponndorf-Verley and Birch reductions. Favorskli reation; Stork enamine reaction; Michael addition, Mannich Reaction; Sharpless asymmetric epoxidation; Ene reaction, Barton reaction, Hofmann- Loffler-Freytag reaction, Shapiro reaction, Baeyer-Villiger reaction, Chichibabin reaction.

Reagents in Organic Synthesis: Use of the following reagents in organic synthesis and functional group transformations; Complex metal hydrides, Gilman's reagent, lithium diisopropylamide (LDA) dicyclohexycarbodiimide. 1,3-Dithiane (reactivity umpolung), trimethylsilyl iodide, tri-n-butyltinhybride, Woodward and Provost hydroxylation, osmium tetroxide, DDQ, selenium dioxide, phase transfer catalysts, crown ethers and Merrified resin, Peterson's synthesis, Wilkinson's catalyst, Baker yeast, ylides and enamines.

Photochemistry: Cis-trans isomeriation, Paterno-Buchi reaction, Norris Type I and II reactions, di- pi methane rearrangement, photochemistry of areanes. Photo rearrangements of ά, β unsaturated enones and dienones.

Aromaticity: Criteria of aromaticity, Aramaticity of ions and annulenes. Construction of pi molecular orbital energy diagram of aromatic and antiaromatic compounds.

Stereochemistry and conformational Analysis: Recognition of symmetry elements and chiral structures; R-S nomenclature, diastereosiomerism in acyclic and cyclic systems; E-Z isomerisms, conformational analysis of cyclic (chair and boat cyclohexanes) and acyclic systems. Interconversion of Fischer, Newman and Sawhorse projections. Newre method of asymmetric synthesis (including enzymatic and catalytic nexus), enantio and diastereo selective synthesis. Effects of conformation on reactivity in acyclic compounds and cyclohexanes.

Coordination Chemistry: Crystal field, ligand field and molecular orbital theories, crystal field splitting of d-orbitals, CFSE, Interpritation of electronic spectra of coordination compounds using Orgel digrams. Calculation of Racahparameter (B') and nephelanxdatic ratio β for octahedral d2/d8 and tetrahedral d2/d7 3d metal complexes. Magnetic properties of 3d metal complexes with A, E and T crystal field ground terms, calculation of effective magnetic moment. Orbital contribution to the magnetic moment, spin-orbit coupling, high spin-low spin equilibria. Mononuclear and polynuclear metal carbonyls. Structure and bonding in metal carbonyls and nitrosyls.

Oranometallic Chemistry: Classification of organometallic compounds based on hapiticity andpolarity of M-C bond, nomenclature and general characteristics. General methods of preparation and important reactions of transition metal **Λ-** complexes of unsatural hydrocarbons such as alkenes, alkynes, allyl, cyclopentadiene and arene. Organometalics in organic synthesis and in homogeneous catalytic reactions (hydrogenation, hydrofomaylation, isomerisation). Activation of small molecules by coordination.

Chemistry of Lanthanides and Actinides: Oxidation states and coordination numbers, spectral and magnetic properties; Ion exchange sepration, use of lanthanide compounds as shift reagents.

Bioinorganic and Bioorganic Chemistry: Metal ions in biological system, Function, Structure and bonding of hemoglobin and myoglobin, molecular mechanism of ion transport across membranes; ionophores. Photosynthesis, PSL, PSH; nitrogen fixation, oxygen uptake proteins, cytochromes. Elementary structure and function of biopolymers such as proteins and nucleic acids.

Chemistry of Non-transitional Elements: General discussion on the properties of the nontransition elements; special features of individual elements; synthesis, properties and structure of their halides and oxides, polymorphism of carbon, phosphorus and sulphur. Synthesis, properties and structure of boranes, carboranes, borazines, silicates carbides, silicones, phosphazenes, sulphur – nitrogen compounds: peroxo compounds of boron, carbon and sulphur; oxy acids of nitrogen, phosphorus, sulphur and halogens, interhalogens pseudohalides and noble gas compounds.

Chemistry of Transition Elements: Coordination chemistry of transition metal ions; Stability constants of complexes and their determination; stabilization of unusual oxidation states. Stereochemistry of coordination compounds. Ligandfield theory, splitting of d-orbitals in low- symmetry environments, Jahn-Teller effect; interpretation of electronic spectra including charge transfer spectra; spectro chemical series, nephelauxetic, series Magnetism: Dia-para-ferro and antiferromagnetism, quenching of orbital angular moment, spinorbit coupling, inorganic reaction mechanisms; substitution reactions, trans effect and electron transfer reactions, photochemical reaction of chromium and ruthenium complexes. Fluxional molecules iso and heteropolyacids; metal clusters. Spin crossover in coordination compounds.

13. DEPARTMENT OF COMMERCE

The Department of Commerce was founded in 1924 and by 1965 the Department got its present identity as a combined setup for Commerce and Business Administration with the inception of B. Com., 5 Year Integrated Programme in Management (BBA & MBA), M. Com. and MBA Programmes

The Department of Commerce of the University of Allahabad has been one of the pioneers in the field of Business Education in the country. The Postgraduate teaching for the Master's Degree in Commerce was started in the Department in the year 1940. The research programmes for Doctoral and Post-Doctoral degree were also launched in the same year. Another dimension to the Department was added in 1958, when it started thinking in terms of planning the future shape of Business Education and the Motilal Nehru Institute of Research and Business Administration (MONIRBA) was formally established. It was basically conceived as a research-oriented unit but had the secondary objective of furthering the cause of Management Education.

The Department was the first among Indian Universities to introduce Post Graduate teaching in Business Administration in the year 1965. The Department is operating from Commerce Building and Motilal Nehru Institute of Research and Business Administration, Chatham Lines, Allahabad, having impressive building and sprawling lawns, requisite number of classrooms, lecture theatres, halls, well equipped laboratories and a fairly big library. The building also houses the Agro Economic Research Centre, the Business Research Unit, the Case Collection Cell, the Placement Cell and the offices. The Department is conducting Graduate, Postgraduate, Doctoral and Postdoctoral Programmes on a full time and regular basis.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Fields related to Commerce and Business Administration

🕮 SYLLABUS FOR CRET LEVEL-1 IN COMMERCE AND BUSINESS ADMINISTRATION

Unit-I: Business Environment

Meaning and Elements of Business Environment

Economic environment, Economic Policies, Economic Planning

Legal environment of Business in India, Competition Policy, Consumer protection, Environment protection

Policy Environment: Liberalization Privatization and globalization, Second generation reforms, Industri8al policy and implementation. Industrial growth and structural changes.

Unit-II: Financial & Management Accounting

Basic Accounting concepts, Capital and Revenue, Financial statements

Partnership Accounts: Admission, Retirement, Death, Dissolution and Cash Distribution Advanced Company Accounts: Issue, forfeiture, Purchase of Business, Liquidation, Valuation of shares, Amalgamation, Absorption and Reconstruction, Holding Company Accounts

Cost and Management Accounting: Ratio Analysis, Funds Flow Analysis, Cash Flow Analysis, Marginal costing and Break-even analysis, Standard costing, Budgetary control, Costing for decision-making Responsibility accounting

Unit – III: Business Economics

Nature and uses of Business Economics, Concept of Profit and Wealth maximization, Demand Analysis and Elasticity of Demand, Indifference Curve Analysis Law

Utility Analysis and Laws of Returns and Law of variable proportions

Cost, Revenue, Price determination in different market situation: Perfect competition, Monopolistic

competition, Monopoly, Price discrimination and Oligopoly, Pricing strategies

Unit – IV: Business Statistics & Data Processing

Data types, Data collection and analysis, sampling, need, errors and methods of sampling, Normal distribution, Hypothesis testing, Analy7sis and Interpretation of Data

Correlation and Regression, small sample tests – t-test, F-test and chi-square test Data processing – Elements, Data entry, Data processing and Computer applications

Computer Application to Functional Areas – Accounting, Inventory control, Marketing

Unit – V: Business Management Principles of Management

Planning – Objectives, Strategies, Planning process, Decision-makiong

Organising, Organisational structure, Formal and Informal Organisations, Organisational culture Staffing

Leading: Motivation, Leadership, Committees, Communication Controlling

Corporate Governance and Business Ethics

Unit – VI: Marketing Management

The evolution of marketing, Concepts of marketing, Marketing mix, Marketing environment Consumer behaviour, Market segmentation

Product decisions Pricing decisions Distribution decisions Promotion decisions

Marketing planning, Organising and Control

Unit – VII: Financial Management

Capital Structure, Financial and Operating leverage Cost of capital, Capital budgeting

Working capital management Dividend Policy

Unit – VIII: Human Resources Management

Concepts, Role and Functions of Human Resource management Human Resource Planning, Recruitment and selection

Training and Development, Succession Planning

Compensation: Wage and Salary Administration, Incentive and Fringe benefits, Morale and Productivity Performance Appraisal

Industrial Relations in India, Health, Safety, Welfare and Social security, Workers' Participation in Management

Unit – IX: Banking and Financial Institution

Importance of Banking to Business, Types of Banks and Their Functions, Reserve Bank of India, NABARD and Rural Banking

Banking Sector Reforms in India, NPA, Capital adequacy norms E-banking

Development Banking: IDBI, IFCI, SFCs, UTI, SIDBI

Accounting and Finance

Accounting standards in India, Inflation Accounting, Human Resource Accounting, Responsibility Accounting, Social Accounting

Money and Capital market, Working of stock exchanges in India, NSE, OTCEI, NASDAQ, Derivatives and Options

Regulatory Authorities: SEBI, Rating Agencies; New Instruments: GDRs, ADRs Venture Capital Funds, Mergers and Acquisitions, Mutual Funds, Lease Financing, Factoring, Measurement of risk and returns securities and portfolios, Computer Application in Accounting and Finance

Marketing

Marketing Tasks, Concepts and Tools, Marketing Environment Consumer Behaviour and Market Segmentation

Product decisions Pricing decisions Distribution decisions Promotion decisions Marketing Researches On-line marketing, Direct Marketing. Social, ethical and legal aspects of marketing in India

Human Resource Management

Concept; Role and Functions of Human Resource Management

Human Resource Planning, Job analysis, Job description and specifications, Use of Job analysis information, Recruitment and Selection, Training and development, Succession Planning

Compensation: Wage and Salary administration, Incentives and Fringe benefits, Morale and Productivity Appraisal Performance

Industrial Relations in India, Health, Safety, Welfare and Social Security, Workers participation in Management

14. DEPARTMENT OF ELECTRONICS AND COMMUNICATION *(COMPUTER SCIENCE)*

The Department of Electronics and Communication formally known as J.K. Institute of Applied Physics and Technology offers PhD in Computer Sciences and PhD in Electronic and Communication.This Department took significant strides in establishing for itself a nationwide reputation. The Department conducts courses in the field of Electronics and Communication and Computer Science leading to the degrees of Bachelor of Technology (B. Tech.), Master of Technology (M. Tech.), B. Sc. (Comp. Sc.) and M. Sc. (Comp. Sc.). These courses are designed to meet the current challenging demands of the Nation.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Applied domains of Electronics and Communication.

🕮 SYLLABUS FOR CRET LEVEL-1 IN COMPUTER SCIENCE

- Digital Logic: Logic functions, Minimization, Design and synthesis of combinational and sequential circuits; Number representation and computer arithmetic (fixed and floating point).
- Computer Organization and Architecture: Machine instructions and addressing modes, ALU and datapath, CPU control design, Memory interface, I/O interface (Interrupt and DMA mode), Instruction pipelining.
- Programming concepts and Data Structures: Programming in C; Functions, Recursion, Parameter passing, Scope, Binding; Abstract data types, Arrays, Stacks, Queues, Linked Lists, Trees, Binary search trees, Binary heaps; Object Oriented Concepts - Principles, classes, inheritance, class hierarchies, polymorphism, dynamic binding.
- Algorithms: Asymptotic notation and algorithmic analysis, Notions of space and time complexity, Worst and average case analysis; Design: Brute force, Greedy approach, Backtracking, Dynamic programming, Divide-and-conquer; Tree and graph traversals, connected components, Spanning trees, Shortest paths; Hashing, Sorting, Searching. Basic concepts of complexity classes P, NP, NP- hard, NP-complete.
- Theory of Computation: Regular languages and finite automata, Context free languages and Pushdown automata, Recursively enumerable sets and Turing machines, Undecidability.
- Compiler Design: Lexical analysis, Parsing, Syntax directed translation, Runtime environments, Intermediate and target code generation, Basics of code optimization.
- Operating System: Processes, Threads, Inter-process communication, Concurrency, Synchronization, Deadlock, CPU scheduling, Memory management and virtual memory, File systems, I/O systems.
- Database Management System: ER-model, Relational model, Relational algebra, Database design, Normal forms, SQL, File structures (sequential files, indexing, B and B+ trees), Transactions and concurrency control.
- Software Engineering: Software life cycle models, information gathering, requirement and feasibility analysis, planning and managing the project, design, coding, testing, implementation, maintenance.
- Computer Networks: ISO/OSI stack, LAN technologies (Ethernet, Token ring), Flow and error control techniques, Routing algorithms, Congestion control, TCP/UDP and sockets, IP(v4), Application layer protocols (icmp, dns, smtp, pop, ftp, http); Basic concepts of hubs, switches, gateways, and routers. Network security basic concepts of public key and private key cryptography, digital signature, firewalls.
- Computer Graphics and Imaging Systems: Display systems, Input devices, 2D Geometry, Graphic operations, Basic Image transforms, Image Enhancement in Spatial domain, Image Enhancement in Frequency domain, Edge Detection, Boundary detection and representation, Region detection.
- Artificial Intelligence: Definitions, Al approach for solving problems, State space representation of problems, Automated reasoning with prepositional logic and predicate logic – fundamental proof

procedure, resolution, Searching - breadth first, depth first, A, A*, AO*, heuristics. Performance comparison of various search techniques, Knowledge representation, Frames, scripts, semantic nets, production systems, Components of an expert system, Machine learning – inductive, Bayesian, and concept learning, Introduction to – Genetic Algorithms, Artificial Neural Networks and Fuzzy logic.

15. DEPARTMENT OF DEFENCE AND STRATEGIC STUDIES

The University of Allahabad pioneered the introduction of Defence Studies in 1940, offering postgraduate and research programs from 1965. Courses were developed with input from esteemed scholars worldwide, including Prof. Michael Howard and Prof. N. Gibbs. The Department achieved recognition, with the UGC considering it for special assistance and potential elevation to a Center of Excellence in Strategic Studies during the Seventh Plan. It established the National Congress for Defence Studies in 1980. The Department excels in teaching, research, publication, and public education. Facilities include labs for map-related experiments, a Cartography Lab, and a Computer Lab. They publish the "Indian Journal of Strategic Studies" and maintain a well-organized library with extensive holdings.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

National Security, Strategic Thoughts, Defence Economics, International Relations, Peace and Conflict, Science and Technology, Maritime Security, Indian's Defence and Security Policy, International Law, Non-Traditional Security, and Indian Military History.

🕮 SYLLABUS FOR CRET LEVEL-1 IN DEFENCE AND STRATEGIC STUDIES

- DefenceofNationalSecuritywithReferencetotheContemporaryThinking.
- Defence, Foreign, Security and Domestic Policies; Concept, Formulation, Objectives and Linkages.
- Military Alliances and Pacts, Peace Treaties, Defence Cooperation, Strategic Partnership and Security Dialougue.
- Environmental Security.
- Armaments: Arms Race, Arms Aid, Arms Trade and Small Arms proliferation.
- Problem of System of Governance and Human Rights.
- Proliferation of Weapons of Mass Destruction (WMD) and NPT, CTBT, MTCR, NMD, and FMCT.
- Military – Indutrial Complex
- Military, Neuclear and Missile Capabilities of China, Pakistan and India.
- End of Cold War and Mergence of New World Order, New Trends after 09/11/2001.
- Development of Central Asian Republics.
- Confidential Building Measures: Concept, Kinds and Utility,
- Civil Defence
- Civil-Military Relations.
- India’s Relation with USA, Russia, China, Pakistan, Israel, European Union, Central Asia.
- Conceptual Analysis of Conflict and Peace.
- Nature and Forms of Conflict.
- Conflict Management and Conflict Resolution.
- Insurgency and Terrorism in South Asia.
- An Evaluation of the Existence, Importance and Future of Guerilla Warfare in the Nuclear Age.
- Terrorism and Human Right Issues.
- Defence Policy of India:1947-1971.
- Defence Policy in India: 1971onwards.
- Higher Defence Organisation in India.
- Powers of the President in relation to the Armed Forces. Parliament and Armed Forces.
- Defence Committee of the Cabinet. Ministry of Defence.

- National Security Council.
- Strategic Thought of India.
- Internal Threats of India's Security: Socio, Economic, Political, Science & Technological, Military and Allied Aspects.
- Security Problems in the North Eastern Region of India.
- Counter Terrorist Strategy of India.
- Future Trends and Prospects of Security in the Region.
- Indian Ocean as a Zone of Peace.
- Development of New marine Technologies.
- Maritime Strategy of India.

16. CENTRE OF SCIENCE & SOCIETY *(RURAL TECHNOLOGY & DEVELOPMENT)*

With the approval of Academic Council vide Resolution No. 43/22 dt.19.5.2015 and Executive Council Resolution No. 03/32 dt.2.6.15 and subsequent office Memorandum No. Comm. Sec./5243/2015 dt. 22.08.2015, the green signal was provided to start the M.Sc. four-semester CBCS based course in Rural Technology and Development under the Institute of Inter-Disciplinary Studies (IIDS) by the University of Allahabad with the intake of 15 seats.

The University took lead to translate the PURA (Providing Urban Amenities in Rural Area) of Dr. A.P.J. Kalam and its execution by PM Modi's Sansad Adarsh Gram Yojana by adopting Ramapur Village of Bahadurpur block in Phulpur Tehsil of Allahabad District. Centre has again adopted five (05) Villages of Koraon Block, Prayagraj as an initiative of Unnat Bharat Abhiyan and MHRD, New Delhi. Moreover, the Centre has got the responsibility of the Post-project evaluation study of Saansad Adarsh Gram Yojna of 104 villages of Uttar Pradesh.

It is also worth mentioning that the University of Allahabad has been identified as a spoke partner of the Design and Innovation Centre of IIT-BHU, getting funds from MHRD. Further, the university approved the change of nomenclature from M.Sc. Rural Technology and Development to M.Sc. Design and Innovation in Rural Technology in 2017.

🛠 RESEARCH DOMAINS OFFERED AT THE CENTRE

India's Rural GDP, Facilitating affordable technology development appropriate to rural progress, and focusing on the sectors that include Agriculture, Health, Finance, Education, Vocational Training, Business Processing technologies, Centre promotes innovative ideas for agro-based rural industries/Industrial technologies such as Vermicomposting, Biofertilizers, Herbal antimicrobials, Candle making, Dairy activities, Mushroom cultivation, Organic farming, Floriculture, Paper bag making, Medicinal plant cultivation, Apiculture. The major thrust area is Innovation in Rural technology for the welfare of Agricultural, Animal and Human health with special reference to Rural Entrepreneurship.

🕮 SYLLABUS FOR CRET LEVEL-1 IN DESIGN AND INNOVATION IN RURAL TECHNOLOGY

- **Introduction to Rural Technology and development**

Indian Rural Society: Nature and Characteristics, Factors of Indian Society- Tribal- Rural- Urban- Rural Urban continuum. Sustainable Development, Globalization, Social Welfare, Social Work. Demography of rural areas, British setup and independent Indian setup, Rural Social structure, Problems of Weaker Sections, Social Problems in India: Population Explosion, Unemployment, Poverty, Gender Discrimination and Inequality, Farmers' suicide, Violation of Human Rights and Women in rural society. Educational and cultural setup in various parts of the country, administrative setup, link up with district headquarters, Concept and meaning of Adult & Non-formal Education. Andragogy and Pedagogy. Rural Institutional Systems, Religious- Concept, Nature, Function and its Changing Structure, Education- Objectives, Functions and Importance, Co-operation- Concept, Nature, Scope, Role and Significance in Rural Development. Different education commissions of India and their recommendations.

Paradigms of Rural Development: Lewis Model of Economic Development, Self Help Group- Concept, Characteristics and Functions, Nature and Scope. Experiments in Rural Development before independence: 'Indicators of Development &Rural Development and their measurements. Gandhian Model of Rural Development, Important issues in Rural Development- Human Resource Development in Rural Development.

- **Global approach in Rural technology:**

Concept of Rural technology development, Scope of Rural technology, Causes of Rural Backwardness, Need for Rural technology Development and its Constraints. Rural Education with emphasis on Primary, Adult and Community Education, Development of Rural Women and Children- Status and Development Strategies. Success of Grameen Model in India, approaches to Rural Development in India. Government schemes for uplifment of rural livelihood.

Role of Panchayati Raj Institutions in Rural Development with special reference to Indian constitution. Land Acquition Bill.

Corporate Social Responsibility: Evidences and the practice of CSR in the context of rural development in India.

- **Production and Post- harvest management:**

Plant Protection: Plant disease, Plant pests' needs for its control, biological control of pests. Integrated Weed management. Agricultural Development under the Plans, Organizational Aspects of Agriculture: Land Reforms, Agro-forestry. Impact of Information Technology on development, growth and governance, satellite communication and remote sensing, geo-informatics application, geospatial information technologies, Information Technology in Agriculture,

Rural Industrialization: Concept, Importance of Rural Industrialization, Village and Cottage Industries, Livestock production, breeding and maintenance (poultry, goattry and piggery). Aquaculture and Fisheries industry in rural setup specially culture and rearing of Carp, Crab, Poly culture, Pearl culture etc. Different government schemes related to fisheries.

- **Plant and Applied Sciences:**

Classification, Morphology and Anatomy of Plants, Main fruits grown in rural places, Orchard Management practices, Processing and marketing of fruits, Nursery; Local health traditions, primary health care, medicinal plant garden for conservation and utilization of medicinal plants; Scientific documentation of traditional and indigenous knowledge related to plants used for healthcare, Medicinal and Aromatic plants, Bonsai Technology, Apiculture; different aspects, Lac Culture, Tasar culture and Sericulture, Different emerging rural industrial technologies, their applications: Horticulture, Floriculture, Pomology, Olericulture; production and possibilities in global economy etc.

Commercial Production Technologies:

- **Mushroom Cultivation**

Biofertilizers Biopesticides and Biosupplements:

Vermicomposting: Principles and functions of Vermicomposting, Biological mechanism of Vermicomposting, large- scale and small- scale production of vermicomposts.

- **Health and Nutrition:**

Indian traditional Medicine; AYUSH, Yoga and its importance.

Socio-economic factors influencing health and nutrition. Basic requirement of nutrition for human body. Women health in Rural India; factors, Sex ratio. Health neglect and its changing scenario in the context of government programme. Mortality and morbidity factors influencing nutrition and health. Affordable treatment for common ailments and injuries first aid, ORS etc. Human Nutrition and Nutrition Education. Rural Health infrastructure: Government Health insurance schemes, bank insurance, smart card for BPL families. Various schemes for family, including free vasectomy, single girl child reward, etc. Community Health centre schemes and government hospital schemes for poor. Safe Drinking water, Concept and need, Rural technology to get safe drinking water, Different schemes and programmes. Sanitation: Personal hygiene and environmental hygiene—concept and need, Different measures of sanitation, Sanitation programme and implementation.

- **Economic status of Rural India:**

Unemployment and Underemployment in Rural Areas- Problems, Causes. Poverty- Causes of Rural Poverty, Poverty alleviation programmes in India- Success and Failure analysis. Poverty alleviation through Micro Finance, Empowerment of Rural Women through Self Help Groups. Commercial Banks, Cooperative Banks, NABARD, Rural Insurance.

Component and classification of rural markets, Rural credit Institutions, Problems in Rural marketing, rural demand. Finace schemes related to economics, Rural Credit – Sources of Credit, Institutional and Non- Instititutional, Institutional Credit for Rural Development in India. Civil Society and NGO

Management, Understanding Civil Societies, Role of Civil Societies, Administrative and financial structure of NGOs, Guideline for NGO Management, NGOs as Society, NGOs as non-profit company, NGOs as Trust.

- **Rural Entrepreneurship:**

Entrepreneurship: Concept of Entrepreneurship, origin and Development of Entrepreneurship. Entrepreneurship Movement in India, role of entrepreneurship in economic development. Small Industries Development corporation (SIDC), Small Scale industries Board (SSIB), State Small Industries Development Corporations (SSIDC), Technical Consultancy Organizations (TCOs).

Rural Entrepreneurship: Meaning of rural entrepreneurship, need for rural entrepreneurship, problems of rural entrepreneurship, NGOs and rural entrepreneurship, Training and Development of rural Entrepreneurs. Entrepreneurship Development programmes (EDPs): Need for EDPs, Objectives of EDPs, Course content and curriculum of EDPs, Phases of EDPs, Evaluation of EDPs. Project Identification and Selection, Project Formulation and Appraisal.

Agencies Supporting Entrepreneurs: District Industries Centre (DICs), Micro, Small and Medium Enterprise (MSME), National Small Industries Corporation (NSIC). Agro Based Industries- Concept, Types, Functions and Importance in Rural Employment Generation.

- **IT in Rural Development**

Elementary knowledge about computer hardware and software, operating system, MS-Office. Data analysis and appropriate software, Different graph type, operating SPSS, Numerical methods of Data Presentation: Mean, Median, Mode, Standard deviation, Correlation, Correlation, Regression, Chi Square Test. Audio-Visual Aids: Materials and Equipment-Planning Preparation and use of different types of audio-visual aids-Projectors Films-Tape recorder Television. Introduction of GIS and its components-spatial data organization and management, Remote sensing and its application in rural development.

17. CENTRE FOR GLOBALIZATION AND DEVELOPMENT STUDIES

The Centre for Development Studies is a pioneering centre at the University of Allahabad, a Central University established by an Act of the Indian Parliament. Its purpose is to study and research phenomena and processes of globalization and development with interdisciplinary approaches. Globalization is being viewed with a variety of perspectives, ranging from epistemological, analytical, and critical to grassroots civil society and public action across the world. Sometimes, it is simply viewed as polemic and semantic. Of late, this phenomenon has assumed enormous significance, necessitating its critical examination from multidisciplinary perspectives as it tends to influence each domain of our life, either in a minor or major way. This is also seen as a shaping factor of the world in the twenty-first century, as it could lead to the restructuring of the global order, economies, and societies, having implications on the overall development discourse, especially since the end of the Cold War.

At the same time, contemporary ideas of development are also undergoing a process of redefinition in all fields of intellectual inquiry, leading to debates and dissents. These processes affect not only the economic development of countries through the integration of capital but also bear implications for human development, discourses of rights and entitlements, and boundaries of nation-states. Furthermore, it is equally important to engage from the point of view of developing societies like India and others. Currently, these societies are undergoing various processes of transformation that require in-depth inquiries to understand their relevance not only for academicians, researchers, and policymakers but also for the general population.

🛠 RESEARCH DOMAINS OFFERED AT THE CENTRE

Globalization as a historical process across the world; Socio-economic, political, and regional linkages of globalization and development, especially in the developing societies; Planning (Rural and Urban) vis-a-vis globalization and development; Tribal societies, globalization and development; State, Civil Society, and Globalization and Development; Democracy, Globalization, and Development; Social Movements, Globalization, and Development; Gender, Globalization, and Development; International Finance, Trade, and Transport; Regional Integration and Development; Area Studies in Asia, Africa, and Latin America; Labor and Migration; Human Development; Rights and Entitlements; Environment, Ecology, and Climate Change; Poverty and Inequality; Identity and Conflict; Corporate, Globalization, and Development; Multi-culturalism; Cosmopolitanism and Nation-states.

🕮 SYLLABUS FOR CRET LEVEL-1 IN DEVELOPMENT STUDIES

Theories of Globalization : Hyper Globalizers, Skeptics and Transformationalists; End of History, End of Ideology, Internationalism, Theories of Conflict, Consensus and Change, Multi-culturalism, State Theory, Development Economics Theory, Democracy Theories of Development: Modernization Theory, Theories of Underdevelopment (World System Theory, Dependency Theory, Development of Underdevelopment); Articulation of Mode of Production, Sustainable Development Approaches to Globalization: Liberal, Classical, Neo-liberal, Neo-classical, Marxist, Neo- Marxist, Neo-Realist, Fundamentalism vs. Secularism, Feminist Approach, Social Constructivist, Cosmopolitanism, Post-modernist Approaches to Development: System Approach, Sectoral Approach, Integrated Approach, Feminist Approach, Reformists vs. Transformationlist, Capability Approach, Centralized vs. Decentralized Planning, Welfareism, Environmental and Ecological Approach, Sen and Dreze, Regional Identities and Cooperation Perspectives: Positivism, Marxism, Idealism, Liberalism, Functionalism Structuralism, Post-Structuralism, Modernism, Post-modernism, Neo-Liberal, Neo- Marxism, Interactionism

Research Design : Exploratory, Descriptive, Explanatory Formulation of Research Problem: Hypothesis, Sources of Data, Observation, Questionnaire, Interview Schedule and Interview Guide, PRA Techniques, Applied Social Research Content Analysis, Case Study, Panel Study, Sampling Methods and Analysis of Data, Scaling Techniques, Graphic Presentation, Thesis Writing, Notes and Bibliography Statistical Techniques: Mean, Median, Mode, SD, Co-relation, Coefficient, Application of Computer in Social Science Research: MS Office, Use of Internet for Social Science Research Economic Growth and Development.

- Factor affecting Economic Growth: Capital, Labour and Technology
- Neo-classical Growth Models: Solow and Meade, Mrs. Joan Robinson'sGrowth Model
- Explanation of Cross-Country Differentials in Economic Growth

- **Sectoral Aspects of Development**
  - Role of Agriculture in Economic Development
  - Efficiency and Productivity in Agriculture
  - New Technology and Sustainable Agriculture
  - Globalization and Agriculture Growth
  - Rationale and Pattern of Industrialization in developing countries
- **Democracy and Development**
  - Colonialism, Neo-colonialism and Post-colonial State
  - Decision Making, Planning and Policies for Development in Westminster and Presidential Forms
  - Democracy, Dissent and Development
- **Political Modernization and Development**
  - Colonial and Post-colonial Development and Modernization
- **Politics and Economics of Development in India**
  - Mixed v/s Open Economy
  - Aim and Objectives of Five Year Plan
- **Democratic Decentralization / Panchayati Raj and Development**
  - Good Governance
- **Basic Concepts of Region**
  - Meaning, Definition and Concept
  - Changing Concepts of the Region from an Inter-disciplinary viewpoint
  - Types of Regions: Formal and Functional, Uniform and Nodal, Single Purpose and Composite Region, Special Purpose Regions
  - Concept of Space, Area and Locational Attributes
- **Theories of Regional Development**
  - Spatial Organization and Integration
  - Theories of Polarized Development
  - Theories of Regional Underdevelopment
  - Theories of Sustainable Development
- **Introducing Planning**
  - Planning Process: Sectoral, Temporal and Spatial Dimensions
  - Short-term and Long-term Perspectives of Planning
  - Regional Development and Multi-regional Planning in a National Context
  - Indicators of Development and their Data Sources
  - Measuring Levels of Regional Development and Disparities
- **Multi-level and Decentralized Planning**
  - Concept of Multi-level planning
  - Decentralized Planning: Sectroal v/s Decentralized; Top-down v/s Bottom-up Planning
- **Regional Development, Planning and Practices in India**
  - Five Year Plans
  - Macro-Meso-Micro Planning in India
  - Target area and Target Group Approach
  - Regional Social Movements and their Linkages with Regional Policy and Regional Development Strategies

- **Introduction to Human Development**
  - Choice, Functioning and Capabilities
  - Approaches: Capability, Commodity based System and Utility Approach, Quality of Life, Basic Needs Approach, Rawlsian Approach
  - Linkages between Human Rights and Human Development: Right lo Development
  - Millennium Development Goals (MDGs): Understanding MDGs, Linkages between Human Development and MDGs
  - Measuring and Reporting on Human Development
  - Emergence of HDI: HDI as compared to per capita GDP, Methods of Computing HDI, Critique of HDI
  - Other Indices: HPI, GRDI, GEI, Using Indices for Policy Purpose, Experiences of HDI and Inter-state Comparison in India
- **Application of Human Development**
  - People's Participation and Action: Forms of Participation (Economic, Sociocultural, Political), Exclusion: Forms and Types (Poor, Women, Minorities and Indigenous)
  - Obstacles to Participation (Legal Systems, Bureaucratic Constraints, Social Norms)
  - PRA and PLA
  - Social Movements; Civil Society, NGOs and CBOs
  - Role of INGOs / Donor Agencies
- **Governance and Human Development**
  - Defining Governance
  - Understanding Governance: Economic, Political and Civil
  - Emerging Issues in Governance
  - Actors in Governance: State, Tiers of Governance
  - Elements in Governance: Institutions, Delivery Mechanisms, Laws, Rules and Procedure.
  - Linkages between Governance and Human Development: Political Freedom, Participation, Decentralization, Empowerment, Equity and Efficiency, Accountability, Right to Information
- **Globalization and Human Development**
  - Implication for Growth
  - Employment, Inequality and Poverty
  - Gender Issues
  - Livelihoods and Rights
  - Health, Education, Environment and Human Security
  - Basic Concepts
  - Inequality–Natural Differences and Social Inequality; Structuring of Inequality, Social Differentiation, Hierarchy, Social Stratification
  - Poverty-Definitions of Poverty: Epistemological and Theoretical Issues concerning the conceptualization of deprivation, exclusion, marginalization and poverty;
  - Development-Growth, Evolution, Progress, Modernization, Sustainable Development
  - Form of Social Inequality
  - Caste, Class, Gender, Ethnicity and Race Methods of Poverty, Deprivation Measurement: Identification of Poor, Gender Poverty, Social and Gender Audit.
  - Social Inequality and Poverty in India
  - Absolute and Relative Poverty
  - Poverty Eradication/Reduction Programmes
  - Social Reforms Movements against Deprivation, Exclusion andMarginalization International Agencies (Bi/Multi-lateral, Aid and Humanitarian) and Poverty Reduction Policies and Programmes in India Comparative Development of Latin America, Asia and Africa Brief Socio-Cultural History and Development Profile of Latin America, Asia and Africa Colonization and Underdevelopment in Latin America, Asia and Africa.
  - Comparative Analysis of Social Development
  - Industrialization and Development
  - Agriculture and Structural Inequality

- Economic Growth, Gender, Education and Health
- North-South Divide and South-South Cooperation
- Share in Global Trade and GDP
- Democracy and Development Case Studies of India, China, Brazil, Venezuela, South Africa, Mali

18. DEPARTMENT OF EARTH & PLANETARY SCIENCES

The Department of Earth and Planetary Sciences at the University of Allahabad has been at the forefront of scientific exploration since its establishment in 1985. Renowned for its pioneering research in Earth and Planetary Sciences, the Department has made significant contributions with its esteemed alumni who made a mark in the field of planetary sciences at the leading research and academic institutions and also excelled in industries at national and international levels. Our esteemed alumni are actively contributing to the nation in various capacities, including serving as faculty members and research scientists in esteemed institutions such as IITs, IISERs, PRL, JNU, BHU, NEHU, Punjab University, South Bihar Central University, and state universities. They also excel as professionals in esteemed organizations like GSI, ONGC, MECL, AMD, CIL, CGWB, NHPC, Indian Oil, NTPC, Reliance Petroleum, UPDGM, Essar Oil, SHELL, and Schlumberger, among others. Furthermore, our graduates have achieved remarkable milestones, with some pursuing careers as research scientists at institutions like JPL and NASA, while others have received prestigious Humboldt research fellowships, solidifying DEPS's reputation as a hub for academic and scientific excellence. The Department continues to foster a culture of innovation, curiosity, and academic rigor, ensuring that budding geoscientists are well-prepared to excel in academia, industry, and research.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Experimental Petrology and Impact Cratering Research, Micropaleontology, Seismology and Hazard Management, Seismic Wave Propagation and Coda Wave Attenuation, Remote Sensing & GIS, Geoexploration, Sedimentology, Environmental Impact Assessment and Management, Engineering Geology and Rock Mechanics.

🕮 SYLLABUS FOR CRET LEVEL-1 IN GEOLOGY/ APPLIED GEOLOGY/ GEO-PHYSICS

- **The Earth and the Solar System:**

Milky Way and the solar system. Modern theories on the origin of the Earth and other planetary bodies. Earth's orbital parameters, Kepler's laws of planetary motion, Geological Time Scale; Space and time scales of processes in the solid Earth, atmosphere and oceans. Age of the Earth. Radioactive isotopes and their applications in earth sciences. Basic principles of stratigraphy. Theories about the origin of life and the nature of fossil record. Earth's gravity and magnetic fields and its thermal structure: Geoid, spheroid; Isostasy.

Earth Materials: Gross composition and physical properties of important minerals and rocks; properties and processes responsible for mineral concentrations; nature and distribution of rocks and minerals in different units of the earth and different parts of India

Surface features and Processes: Physiography of the Earth; weathering, erosion, transportation and deposition of Earth's material; formation of soil, sediments and sedimentary rocks; energy balance of the Earth's surface processes; physiographic features and river basins in India

Interior of the Earth, Deformation and Tectonics

Basic concepts of seismology and internal structure of the Earth. Physico-chemical and seismic properties of Earth's interior. Concepts of stress and strain. Behaviour of rocks under stress; Folds, joints and faults. Earthquakes – their causes and measurement. Interplate and intraplate seismicity. Paleomagnetism, sea floor spreading and plate tectonics.

- **Environmental Earth Sciences**

Properties of water; hydrological cycle; water resources and management. Energy resources, uses, degradation, alternatives and management; Ecology and biodiversity. Impact of use of energy and land on the environment. Exploitation and conservation of mineral and other natural resources. Natural

hazards. Elements of Remote Sensing.

- **MINERALOGY AND PETROLOGY:**

Concept of point group, space group, reciprocal lattice, diffraction and imaging. Concepts of crystal field theory and mineralogical spectroscopy. TEM and SEM applications. Lattice defects (point, line and planar). Electrical, magnetic and optical properties of minerals. Bonding and crystal structures of common oxides, sulphides, and silicates. Transformation of minerals – polymorphism, polytypism, and polysomatism. Solid solution and exsolution.

Steady-state geotherms. Genesis, properties, emplacement and crystallization of magmas. Phase equilibrium studies of simple systems, effect of volatiles on melt equilibria. Magma-mixing, - mingling and -immiscibility.

Metamorphic structures and textures; isograds and facies. Mineral reactions with condensed phases, solid solutions, mixed volatile equilibria and thermobarometry. Metamorphism of pelites, mafic-ultra mafic rocks and siliceous dolomites. Material transport during metamorphism. P-T-t path in regional metamorphic terrains, plate tectonics and metamorphism.

Petrogenetic aspects of important rock suites of India, such as the Deccan Traps, layered intrusive complexes, anorthosites, carbonatites, charnockites, khondalites and gondites.

- **STRUCTURAL GEOLOGY AND GEOTECTONICS:**

Theory of stress and strain. Behaviour of rocks under stress. Mohr circle. Various states of stress and their representation by Mohr circles. Different types of failure and sliding criteria. Geometry and mechanics of fracturing and conditions for reactivation of pre-existing discontinuities. Paleostress analyses. Common types of finite strain ellipsoids. L-, L-S-, and S-tectonic fabrics. Techniques of strain analysis. Particle paths and flow patterns. Progressive strain history and methods for its determination. Deformation mechanisms. Role of fluids in deformation processes. Geometry and analyses of brittle-ductile and ductile shear zones. Sheath folds. Geometry and mechanics of development of folds, boudins, foliations and lineations. Interference patterns and structural analyses in areas of superposed folding. Fault-related folding. Gravity induced structures. Major tectonic features and associated structures in extensional-, compressional-, and strike-slip-terranes. Geological and geophysical characteristics of plate boundaries. Geodynamic evolution of Himalaya.

- **PALEONTOLOGY AND ITS APPLICATIONS:**

Theories on origin of life. Organic evolution – Punctuated Equilibrium and Phyletic Gradualism models. Mass extinctions and their causes. Application of fossils in age determination and correlation. Paleoecology, Life habitats and various ecosystems, Paleobiogeography. Modes of preservation of fossils and taphonomic considerations. Types of microfossils. Environmental significance of fossils and trace fossils. Use of microfossils in interpretation of sea floor tectonism. Application of micropaleontology in hydrocarbon exploration. Oxygen and Carbon isotope studies of microfossils and their use in paleoceanographic and paleoclimatic interpretation. Important invertebrate fossils, vertebrate fossils, plant fossils and microfossils in Indian stratigraphy.

- **SEDIMENTOLOGY AND STRATIGRAPHY:**

Clastic sediments- gravel, sand and mud; biogenic, chemical and volcanogenic sediments. Classification of conglomerates, sandstones and mudstones, and carbonate rocks. Flow regimes and processes of sediment transport. Sedimentary textures and structures. Sedimentary facies and environments, reconstruction of paleoenvironments. Formation and evolution of sedimentary basins. Diagenesis of siliciclastic and carbonate rocks.

Recent developments in stratigraphic classification. Code of stratigraphic nomenclature – Stratotypes, Global Boundary Stratotype Sections and Points (GSSP). Lithostratigraphic, chronostratigraphic and biostratigraphic subdivisions. Methods of startigraphic correlation including Shaw's Graphic correlation. Concept of sequence stratigraphy. Rates of sediment accumulation, unconformities. Facies concept in Stratigraphy – Walther's law. Methods for paleogeographic reconstruction. Earth's Climatic History. Phanerozoic stratigraphy of India with reference to the type areas– their correlation with equivalent formations in other regions. Boundary problems in Indian Phanerozoic stratigraphy.

- **MARINE GEOLOGY AND PALEOCEANOGRAPHY:**

Morphologic and tectonic domains of the ocean floor. Structure, composition and mechanism of the formation of oceanic crust. Seawater-basalt interactions, hydrothermal vents- chemical and biological

significance of hydrothermal vents systems. Ocean margins and their significance. Ocean Circulation, Coriolis effect and Ekman spiral, convergence, divergence and upwelling, El Nino. Thermohaline circulation and oceanic conveyor belt. Formation of Bottom waters; major water masses of the world's oceans. Oceanic sediments: Factors controlling the deposition and distribution of oceanic sediments; geochronology of oceanic sediments, diagenetic changes in oxic and anoxic environments. Tectonic evolution of the ocean basins. Mineral resources. Paleoceanography – Approaches to paleoceanographic reconstructions; various proxy indicators for paleoceanographic interpretation. Joint Global Ocean Flux Study (JGOFS) and its applications in Paleoceanography. Ocean Drilling Programme and its major accomplishments in paleoceanography. Opening and closing of ocean gateways and their effect on circulation and climate during the Cenozoic. Sea level processes and Sea level changes.

- **GEOCHEMISTRY:**

Structure and atomic properties of elements, the Periodic Table; ionic substitution in minerals; Phase rule and its applications in petrology, thermodynamics of reactions involving pure phases, ideal and non-ideal solutions, and fluids; equilibrium and distribution coefficients. Nucleation and diffusion processes in igneous, metamorphic and sedimentary environments, redox reactions and Eh-pH diagrams and their applications. Mineral/mineral assemblages as 'sensors' of ambient environments. Geochemical studies of aerosols, surface-, marine-, and ground waters. Radioactive decay schemes and their application to geochronology and petrogenesis. Stable isotopes and their application to earth system processes.

- **ECONOMIC GEOLOGY:**

Magmatic, hydrothermal and surface processes of ore formation. Metallogeny and its relation to crustal evolution; Active ore-forming systems, methods of mineral deposit studies including ore microscopy, fluid inclusions and isotopic systematics; ores and metamorphism- cause and effect relationships. Geological setting, characteristics, and genesis of ferrous, base and noble metals. Origin, migration and entrapment of petroleum; properties of source and reservoir rocks; structural, stratigraphic and combination traps. Methods of petroleum exploration. Petroliferous basins of India. Origin of peat, lignite, bitumen and anthracite. Classification, rank and grading of coal; coal petrography, coal resources of India. Gas hydrates and coal bed methane. Nuclear and non- conventional energy resources.

- **PRECAMBRIAN GEOLOGY AND CRUSTAL EVOLUTION:**

Evolution of lithosphere, hydrosphere, atmosphere, biosphere, and cryosphere; lithological, geochemical and stratigraphic characteristics of granite – greenstone and granulite belts. Stratigraphy and geochronology of the cratonic nuclei, mobile belts and Proterozoic sedimentary basins of India. Life in Precambrian. Precambrian – Cambrian boundary with special reference to India.

- **QUATERNARY GEOLOGY:**

Definition of Quaternary. Quaternary Stratigraphy – Oxygen Isotope stratigraphy, biostratigraphy and magnetostratigraphy. Quaternary climates – glacial-interglacial cycles, eustatic changes, proxy indicators of paleoenvironmental/ paleoclimatic changes, - land, ocean and cryosphere (ice core studies). Responses of geomorphic systems to climate, sea level and tectonics on variable time scales in the Quaternary, Quaternary dating methods, –radiocarbon, Uranium series, Luminescence, Amino-acid, relative dating methods. Quaternary stratigraphy of India– continental records (fluvial, glacial, aeolian, palaeosols and duricrust); marine records; continental-marine correlation of Quaternary record.

Evolution of man and Stone Age cultures. Plant and animal life in relation to glacial and interglacial cycles during Quaternary. Tectonic geomorphology, neotectonics, active tectonics and their applications to natural hazard assessment.

- **APPLIED GEOLOGY:**

Remote Sensing and GIS: Elements of photogrammetry, elements of photo- interpretation, electromagnetic spectrum, emission range, film and imagery, sensors, geological interpretations of air photos and imageries. Global positioning systems. GIS- data structure, attribute data, thematic layers and query analysis.

Engineering Geology: Engineering properties of rocks and physical characteristics of building stones, concretes and other aggregates. Geological investigations for construction of dams, bridges, highways and tunnels. Remedial measures. Mass movements with special emphasis on landslides and causes of hillslope instability. Seismic design of buildings.

Mineral Exploration: Geological, geophysical, geochemical and geobotanical methods of surface and

sub-surface exploration on different scales. Sampling, assaying and evaluation of mineral deposits.

Hydrogeology: Groundwater, Darcy's law, hydrological characteristics of aquifers, hydrological cycle. Precipitation, evapotranspiration and infiltration processes. Hydrological classification of water-bearing formations. Fresh and salt-water relationships in coastal and inland areas. Groundwater exploration and water pollution. Groundwater regimes in India.

- **GEOPHYSICS:**

Signal Processing: Continuous and discrete signals; Fourier series; linear time invariant systems with deterministic and random inputs; band limited signal and sampling theorem; discrete and Fast Fourier transform; Z-transform; convolution; Filters: discrete and continuous, recursive, non-recursive, optimal and inverse filters; deconvolution.

Field theory: Newtonian potential; Laplace and Poisson's equations; Green's Theorem; Gauss' law; Continuation integral; equivalent stratum; Maxwell's equations and electromagnetic theory; Displacement potential, Helmhotz's theorem and seismic wave propagation.

Numerical analysis and inversion: Numerical differentiation and integration, finite element, and finite difference techniques; Simpson's rules; Gauss' quadrature formula; initial value problems; pattern recognition in Geophysics. Well posed and ill-posed problems; method of least squares; direct search and gradient methods; generalized inversion techniques; singular value decomposition; global optimization.

Gravity and Magnetic fields of the earth: Normal gravity field; Clairaut's theorem; Shape of the earth; deflection of the vertical, geoid, free-air, Bouguer and isostatic anomalies, isostatic models for local and regional compensation. Geomagnetic field, secular and transient variations and their theories; palaeomagnetism, construction of polar wandering curves.

Plate Tectonics and Geodynamics: Vine-Mathews hypothesis, marine magnetic anomalies, sea floor spreading; mid-oceanic ridges and geodynamics; plate tectonics hypothesis; plate boundaries and seismicity. Heat flow mechanisms, core-mantle convection and mantle plumes.

Seismology & Tomography: Seismometry: short period, long period, broad band and strong motion; elements of earthquake seismology; seismic sources: faulting source, double couple hypothesis, elastodynamics, Haskell's function, seismic moment tensor, focal mechanism and fault plane solutions; seismic gaps; seismotectonics and structure of the earth; Himalayan and stable continental region earthquakes, reservoir induced seismicity; seismic hazards; earthquake prediction.

Gravity and Magnetic Methods: Gravimeters and magnetometers; data acquisition from land, air and ship; corrections and reduction of anomalies; ambiguity; regional and residual separation; continuation and derivative calculations; interpretation of anomalies of simple geometric bodies, single pole, sphere, horizontal cylinder, sheet, dyke and fault. Forward modelling and inversion of arbitrary shaped bodies and 2-D, 3-D interfaces. Interpretations in frequency domain.

Electrical and Electromagnetic Methods: Electrical profiling and sounding, typical sounding curves, pseudo-sections; resistivity transform and direct interpretation; induced polarization methods. Electromagnetic field techniques; elliptic polarization, in-phase and out of phase components, horizontal and vertical loop methods; interpretation; VLF (very low frequency); AFMAG (Audio frequency magnetic) methods; and central frequency sounding; transient electromagnetic methods; magneto-telluric method; geomagnetic depth sounding.

Seismic Methods: Generalized Snell's Law; Ray theory; reflection, refraction, diffraction; Zoeppritz's equation; seismic energy sources; detectors; seismic noises and noise profile analysis; seismic data recording and telemetry devices; reduction to a datum and weathering corrections; Interpretation of a refraction seismic data by graphical and analytical techniques; CDP/CMP; seismic reflection data processing, velocity analysis, F-K filtering, stacking, deconvolution, migration before and after stack; bright spot analysis; wavelet processing; attenuation studies, shear waves, AVO; VSP; introduction to 3D seismics; seismic stratigraphy.

Well logging and other methods: Open hole, cased hole and production logging; Electrical logs; lateral, latero, induction, S.P; porosity logs; sonic, density, neutron; natural gamma; determination of formation factor, porosity, permeability, density, water saturation, lithology; logging while drilling. Radioactive and geothermal methods.

19. DEPARTMENT OF ECONOMICS

The Department of Economics became a truly full-fledged department in 1914, with the appointment of Herbert Stanley Jevons (son of the marginalist, W.S. Jevons) as the first Professor of Economics and Head.A post-graduate course was also introduced the same year, so that the full fledgling department offered both, under-graduate and post-graduate courses. Origins are like riddles which may never be completely solved, and the Department of Economics is no exception.

It also has a Planning and Development Unit, created through an endowment by the Planning Commission, Government of India, with the renowned development economist, Jean Dreze was Associated with it as the Honorary Chair Professor. The UGC also selected the Department under Special Assistance Programme (SAP) in 2004-05, DRS-I level. The Departmental library has more than fifteen thousand books and it subscribes 35 national and international journals.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Environmental Economics, Social Sector, Gender Economics

🕮 SYLLABUS FOR CRET LEVEL-1 IN ECONOMICS

Theory Demand-Axiomatic Approach, Demand Functions, Consumer Behaviour under conditions of Uncertainty. Theory of Production, Collusive and Collusive Oligopolies, Different models of objectives of the firm – Baumol, Morris and Williamson, Factor Pricing, General Equilibrium and Welfare Economics

Keynesian and Post-Keynesian approaches to theory of output and employment; concept of investment multiplier; consumption hypotheses, Theory of investment and accelerator, Theories of Demand for Money – Keynesian and post-Keynesian, Different approaches to money supply; money supply; components and determinants; money multiplier, Output-Price Determination (aggregate supply and aggregate demand curve analysis), Fleming-Mundell Open Economy Model.

Development and Growth Role of Institutions, Theories of Growth and Development – Models of Growth of Joan Robinson and Kaldor; Technical Progress-Hicks, Harrod and Learning by doing, Production Function Approach to the Determinants of Growth: Endogenous Growth: Role of Education, Research and Knowledge – Explanation of Cross-Country Differentials in Economic Development and Growth.

Theories of Development – Classical, Marx, Schumpeter and Structural Analysis of Development - Imperfect Market Paradigm, Lewis, Model of Development, Ranis-Fei Model, Dependency Theory of Development, Factor in Economy Development – Natural Resources, Population, Capital, Human Resource Development and Infrastructure.

Trade and Development – Trade as engine of Growth two gap Analysis, Prebisch, Singer and Myrdal Views; Gains from Trade and LDCs.

Theories of Taxation, Types, Incidence and Effects. Theories of Public Expenditure Effects on Saving, Investment and Growth, Burden of Public Debt.

Union Finance – Trends in Revenue and Expenditure of the Government of India State Finance – Trends in Revenue and Expenditure of the State Governments

Public Debt India's Public Debt Since 1951 – Growth Composition, Ownership, Pattern and Debt Management.

Union State Financial Relations – Horizontal and Vertical Imbalance; the Financial Commissions. Fiscal Policy and Fiscal reforms in India – Fiscal, Reform Deficit, Recovery & FRBM.

Monetary Approach and Adjustment in the Balance of Payments, Regional Blocs – Multilateralism and World Trading System, The Political Economy of Imposition of Non-Tariff Barries, International Trade under conditions of imperfect competition in Goods Market Theory of International Reserves.

Optimum Currency Areas – Theory and Impact in the Developed and Developing Countries. WTO and its Impact on the different Sectors of the Economy. Components of Money Supply, Role, Constituents and Functions of Money and Capital Markets. RBI recent Monetary and Credit Policies,

Commercial Banks and Co-operatives Banks. Specialised Financial and Investment Institutions, Non Bank Financial Institutions and Regional Rural Banks.

Industrial Structure and Economic Growth, Pattern of Industrialisation - Public and Private, Large and Small Industries, Theories of Industrial location – Indian Experience, Industrial Productivity – Measurement, Partial and total trends, Industrial Finance in India, Industrial Labour – Problems, Policies and Reforms in India, Economic Reforms and Industrial Growth.

Population and Economic Development – Interrelation between population, Development and Environment, sustainable Development, Malthusian theory of Population, Optimum theory of Population (theory of demographic transition, population as 'Limit' to Growth' and as 'Ultimate Source', Concept of Demography – Vital rates, Life tables, composition and uses, Measurement of fertility – Total fertility rate, gross and net reproduction rate – Age pyramids, population projection – stable, stationary and quasi-stationary population; characteristics of Indian population through recent census.

Poverty in India – Absolute and Relative; analysis of Poverty in India, Environment as necessity – amenity and public goods; causes of environmental and ecosystem degeneration – policies for controlling pollution – economic and persuasive; their relative effectiveness in LDCs; Relation between population, poverty and environmental degradation – micro-planning for environment and eco-preservation – water sheds; joint forest management and self-help groups.

Role of State in Environmental Preservation – Review of Environmental legislation in India. Role of Agriculture in Indian Economy – Share of Agriculture, Interrelationship between Agriculture and Industry.

Institution Aspects – Land Reforms, Green Revolution, Technological Aspects – Agricultural inputs and shifts in production function, Capital formation in the Rural Sector – Saving, Assets and Credits, Strategies for Rural Development, Regional Disparities in Indian Agriculture, Cooperative movement in India – Organisation, Structure and Development of different types of Cooperatives in India.

Application of Differential and Integral Calculus in Theories of Consumer Behaviour, Production and Pricing under different Market Conditions, Input-Output Analysis and Linear programming, Application of Correlation and Regression, Testing of Hypothesis in Regression Analysis.

20. DEPARTMENT OF EDUCATION

The Department of Education at the University of Allahabad, established in 1942 with an M.Ed. program, has a rich history of academic excellence. Colonel Sohan Lal served as its first Head. The department expanded its offerings over the years, introducing B.A. classes in 1949 and M.A. classes in 1981. In 2017, it celebrated 75 years of excellence. It actively participated in UGC SAP initiatives, running DRS-I from 2011 to 2016 and currently running DRS Phase-II (2018-2023). Collaborations with organizations like UGC, NCERT, NCTE, and SIEMAT have enriched academic endeavors. The department is known for its publications, including the "Research and Studies" journal since 1950 and UGC-SAP Annual Newsletters since 2013. Additionally, it boasts well-equipped labs in Educational Psychology, Educational Technology, and Science Education.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Quality issues in education, spanning various disciplines like educational technology and ICT, have driven changes in educational philosophy, psychology, sociology, and administration. The interplay of these domains is especially evident in open and distance learning. Educational technology and ICT have revolutionized how knowledge is accessed, challenging traditional educational philosophies. Educational psychology plays a crucial role in understanding how learners engage with these technologies. Additionally, educational sociology helps navigate the social impact of these changes, while educational administration adapts to the evolving landscape. Open and distance learning is a key response to these challenges, offering flexible, accessible education, but it must grapple with quality assurance and equity concerns.

🕮 SYLLABUS FOR CRET LEVEL-1 IN EDUCATION

- **Western School of Philosophy:**

Idealism, Realism, Naturalism, Pragmatism, Existentialism with special reference to the concepts of knowledge, reality and values; their educational implications for aims, contents and methods of teaching.

- **Indian Schools of Philosophy:**

Vedanta, Buddhism, Jainism, Islamic traditions with special reference to the concepts of knowledge, reality and values; and their educational implications.

- **Contributions of Educational Thinkers:**

Vivekananda, Tagore, Gandhi and Aurobindo to Education.

Meaning and nature of Sociology of Education, Education and social change, Constraints on social change (Caste, ethnicity, class, language, religion, population and regionalism). Education as related to social equity and equality of educational opportunities. Education of socially and economically disadvantaged section of society with special reference to scheduled castes and scheduled tribes, Women and rural population. Education as a fundamental right.

- **Process of growth and Development with reference to:**
  - Physical, Social, Emotional and Intellectual development.
  - Development of Concept formation, Logical reasoning, Problem solving and Creative thinking, Language Development.
  - Individual differences – determinants- role of heredity and environment. Implication of individual differences for organizing educational programmes.

Intelligence Its Theories and Measurement.

Learning and Motivation.

Theories of learning: Thorndike's connectionism, Pavlov's Classical and Skinners operant Conditioning;

Learning by insight. Hull's reinforcement theory and Tolman's theory of learning.
Gagne's hierarchy of learning. Factors influencing learning. Learning and Motivation.
Transfer of learning and its theories.
Personality: type and theories- measurement of personality Mental health and hygiene.
Process of adjustment, conflicts and defence mechanism.
Concept and principles of guidance and counselling, types of guidance and counselling. Tools and Techniques of Guidance - records, scales and tests, interview. Organizing Guidance services at different levels of education, occupational information, kinds of services, like information testing, counselling and follow-up.
Meaning and Nature of Educational Research, Types, Theory development, Nature of Variables, Formulation of Research Problem.
Hypothesis: Concept, difference with assumptions, source, various types of hypothesis. Sample: Concept of population and sample, Various method of sampling.
Tools: Questionnaire, Observation and interview as tools of data collection, tests and scales
Descriptive Research, Ex-Post facto Research, Survey Method, Historical Research
Experimental Research: Designs of experimental research, Characteristics internal and external validity in experimental research
Qualitative research: Phenomenological research, Ethnomethodical and Naturalistic inquiry.
Analysis of Data
Descriptive and inferential statistics. The null hypothesis, test of significance. Types of error, one-tailed and two–tailed tests
The t–test
The F- test (One-way ANOVA)
Non-Parametric tests (Chi-Square test)
Biserial, Point–biserial, tetrachoric and phi-coefficient of correlation Partial and Multiple correlations
Universalization of elementary education in India Vocationalization of education in USA and India.
Educational Administration in USA, UK (Britain and Ireland) and India Distance education and continuing education in Australia, UK and India Construction and Development of Curriculum-different models Administrative, Grassroot, Demonstration, System Analysis.
Measurement and Evaluation- Formative evaluation, Summative evaluation.
Characteristics of a good measuring tool, Reliability, Validity and Norm, Construction and standardization of Achievement test.
Educational Administration and Management: Concept and Development
Taylorism, Administration as a process, Administration as a bureaucracy, Human relation approach to administration, System era.
Modern trends in Educational Administration such as,

- Decision making
- Organizational Compliance
- Organizational Development
- PERT
- System Approach and Total Quality Management.

Educational Technology, Meaning and Nature Systems Approach; Communication: Concept theory and barriers. ICT in education: meaning, scope, uses. Open and Distance learning system: Needs, scope and models, Student support services.

21. DEPARTMENT OF ELECTRONICS & COMMUNICATION

The Department of Electronics and Communication at J.K. Institute of Applied Physics and Technology, located within the University of Allahabad's Science faculty campus, has a rich history. Established with the foundation stone laid by India's first Prime Minister, Pt. Jawahar Lal Nehru, in 1949 and inaugurated in 1956, this pioneering department offers courses in Electronics, Communication, and Computer Science. Under the leadership of Prof. S.N. Ghosh, it gained a national reputation. The department provides Bachelor and Master of Technology degrees, as well as B.Sc. and M.Sc. in Computer Science, catering to the nation's evolving needs. DRDO recognizes it for computer science education, and its state-of-the-art facilities, along with impressive placements, have produced influential alumni worldwide.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Applied subjects of Electronics and Communication

🕮 SYLLABUS FOR CRET IN ELECTRONICS & COMMUNICATION

Applicants applying for PhD in the Electronics & Communication subject are not required to participate in the CRET Level-1 examination.

22. DEPARTMENT OF ENGLISH AND MODERN EUROPEAN LANGUAGES

The Department of English and Modern European languages, University of Allahabad, has a unique distinction of being one of the oldest English Departments in the country. Established in 1922, it was part of the British plan of westernizing the natives of the land through education, "the white man's burden". As part of that colonial legacy, we still have the S.G Dunn (our first British Head of the Department) memorial gold medal for the undergraduate topper in English. This historical truth and inheritance always gave the Department an elitist character. We have had our share of brown sahibs walking the portals of the grand Edwardian Mughal structure (with Rajasthani artefacts) that houses us till date. There were great teachers in this Department who in their own style carried the mantles of Oxford dons that they reflected in the then "Oxford of the East" of which the English Department could be called the truest representative.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

British Literature, Literary Theory and Criticism, American Literature, Literatures from Anglophone Countries, Indian Literatures in English, Comparative and Translation Studies, Film Studies, etc.

🕮 SYLLABUS FOR CRET LEVEL-1 IN ENGLISH

The Course for English will include the following topics:

- Chaucer to Shakespeare
- Jacobean and Restoration Periods
- Augustan Age: 18th Century literature
- Romantic Period
- Victorian Period
- Modern Period
- Contemporary Period
- American and Other Non-British Literatures
- Literary Theory and Criticism
- Rhetoric and Prosody.

23. CENTRE OF ENVIRONMENTAL SCIENCE

The Centre of Environmental Studies is an interdisciplinary academic field that integrates numerous academic fields, particularly sciences. Its primary focus is to study the structure and function of our life-supporting environment, understanding the causes, effects, and solutions to various environmental issues. The center emphasizes all the elements and factors that shape or influence our life-supporting biophysical environment, including earth processes, ecological systems, biodiversity, natural resources, alternative energy systems, climate change, various forms of pollution, and more.

Environmental Science incorporates information from several other disciplines and is thus multidisciplinary in nature. As a result, the Centre of Environmental Studies encompasses Biology, Chemistry, Physics, Geology, Geography, Sociology, Economics, Management, and Ethics. Its major subdivisions include Ecology, Geosciences, Environmental Chemistry, Atmospheric Science, Environmental Biology, Environmental Toxicology, Environmental Impact Assessment, and others.

🛠 RESEARCH DOMAINS OFFERED AT THE CENTRE

Environmental Biotechnology, Environmental Microbiology, Environmental Pollution, Nutrient Transport, Fate and Transport of Heavy Metal, Stable Isotope, Restoration Ecology, Soil Carbon Sequestration, Land Use Change, Forest Ecology and Management, Land Degradation, Soil Erosion, Sustainability, Climate Change, Food Security, Geospatial Technology for Natural Resource Management, Urban Heat Island, Aerosols Interaction, Stubble Burning, Wetland Dynamics, Land Degradation, Monitoring of Organochlorine Pesticides and Heavy Metals in Soil and Water, Hydrogeology, Biogeochemistry, Health Risk Assessment, Solid Waste Management, Natural Hazards, Water and Soil Pollution.

🕮 SYLLABUS FOR CRET LEVEL-1 IN ENVIRONMENTAL SCIENCE

- Definition, Principles and Scope of Environmental Science.
- Earth, Man and Environmental. Ecosystems, Pathways in Ecosystems.
- Physico–chemical and Biological factors in the Environment.
- Geographical Classification and Zones.
- Structure and composition of atmosphere, hydrosphere, lithosphere and biosphere. Mass and Energy transfer across the various interfaces, material balance. First and Second law of thermodynamics, heat transfer processes. Scale of Meteorology, Pressure, Temperature, Precipitation, Humidity, Radiation and Wind. Atmospheric Stability, Inversions and Mixing Heights Windroses.
- Natural resources, conservation and sustainable development.
- **Fundamentals of Environmental Chemistry:** Stochiometry, Gibbs', energy, Chemical potential, chemical equilibria, acid base reactions, solubility product, the solubility of gases in water, the carbonate system, unsaturated and saturated hydrocarbons, radionuclides.
- **Chemical Composition of Air:** Classification of elements, chemical speciation Particles, ions and radicals in the atmosphere. Chemical processes for the formation of inorganic and organic particulate matter. Thermo-chemical and photochemical reactions in the atmosphere. Oxygen and Ozone chemistry, Chemistry of air pollutants, Photochemical smog.
- **Water Chemistry:** Chemistry of water, concept of DO, BOD, COD, sedimentation, coagulation, filtration, Redox potential.
- **Soil Chemistry:** Inorganic and organic components of soil, Nitrogen pathways and NPK in soils.
- **Toxic Chemicals in the Environment–Air, Water:** Pesticides in water. Bio– chemical aspects of Arsenic. Cadmium, Lead, Mercury, Carbon Monoxide, O_3 and PAN Pesticides, Insecticides, MIC

carcinogens in the air.

- **Principles of Analytical Methods:** Titrimetry, Gravimetry, Colourimetry, Spectrophotometry, Chromatography, Gas Chromatography, Atomic Absorption Spectrophotometry, GLC, HPLC, Electrophoresis X–ray fluorescence, X–ray diffraction, Flame photometry.
- Definition, Principle and scope of ecology, Human ecology and Human settlement, Evolution, Origin of life and speciation.
- **Ecosystems:** Structure and functions, Abiotic and Biotic components, energy flows, Food chains, Food, web, Ecological pyramids, types and diversity.
- Ecological Succession, Population, Community ecology and Parasitism, Preypredator relationships.
- **Common flora and fauna in India**
- **Aquatic:** Phytoplankton, Zooplankton and Macrophytes
- **Terrestrial:** Forests
- **Endangered and Threatened Species**
- **Biodiversity and its conservation:** Definition, 'Hotspots' of Biodiversity. Strategies for Biodiversity conservation. National Parks and Sanctuaries. Gene pool.
- **Microflora of Atmosphere:** Air sampling techniques. Identification of aeroallergens. Air–borne diseases and allergies.
- **Environmental Biotechnology:** Fermentation Technology, Vermiculture technology. Biofertilizer technology.
- **Environmental Geosciences-** Fundamental concepts.
- **The earth system and Biosphere:** Conservation of matter in various geospheres– lithosphere, hydrosphere, atmosphere and biosphere. Energy budget of the earth. Earth's thermal environment and seasons. Ecosystems flow of energy and matter. Coexistence in communities–food webs. Earth's major ecosystem–terrestrial and aquatic. General relationship between landscape, biomes and climate. Climates of India, Indian Monsoon, E1 Nino, Droughts. Tropical cyclones and Western Disturbance.
- **Earth's Processes and Geological Hazards:** Earth's processes; concept of residence, time and rates of natural cycles, Catastrophic geological hazards. Study of floods, landslides, earthquakes, volcanism and avalanche. Prediction and perception of the hazards and adjustments to hazardous activities.
- **Mineral Resources and Environment:** Resource and Reserves, Minerals and Population. Oceans as new areas for exploration of mineral resources. Ocean ore and recycling of resources. Environmental impact of exploitation, processing and smelting and minerals.
- **Water Resources and Environment:** Global Water Balance. Ice sheets and fluctuations of sea levels. Origin and composition of seawater. Hydrological cycle. Factors influencing the surface water. Types of water. Resources of oceans. Ocean pollution by toxic wastes. Human use of surface and groundwaters. Groundwater pollution.
- **Landuse Planning:** The landuse plan. Soil surveys in relation to landuse planning. Methods of site selection and evaluation.
- **Environmental Geochemistry:** Concept of major, trace and REE. Classification of trace elements, Mobility of trace elements, Geochemical cycles. Biogeochemical factors in environmental health. Human use, trace elements and health. Possible effects of imbalance of some trace elements. Diseases induced by human use of land.
- Principle of Remote Sensing and its application of Environmental Sciences. Application of GIS in Environmental Management.
- **Sun as source of energy; solar radiation and its spectral characteristics:** Fossil fuels–classification, composition, physico–chemical characteristics and energy content of coal, tidal, petroleum and natural gas. Principles of generation of hydroelectric power, tidal, Ocean Thermal Energy Conversion, wind, geothermal energy; solar collectors, photovoltaics, solar ponds; nuclear energy–fission and fusion; magneto hydrodynamic power, bio–energy–energy from biomass and biogas, anaerobic digestion; energy use patter in different parts of the world.
- Environmental implication of energy use: CO2 emissions, global warming: air and thermal pollution: radioactive waste and radioactivity from nuclear reactors: impacts of large–scale exploitation of Solar, Wind, Hydro and Ocean energy.

- **Air:** Natural and anthropogenic sources of pollution. Primary and Secondary pollutants. Transport and diffusion of pollutants. Gas laws governing the behaviour of pollutants in the atmosphere. Methods of monitoring and control of air pollution SO2, NOX, CO, SPM. Effects of pollutants on human begins, plants, animals, materials and on climate. Acid Rain. Air Quality Standards.
- **Water:** Types, sources and consequences of water pollution. Physico–chemical and Bacteriological sampling and analysis of water quality. Standard, sewage and waste water treatment and recycling. Water quality standard.
- **Soil:** Physico–chemical as bacteriological sampling as analysis of soil quality. Soil Pollution Control. Industrial waste effluents and heavy metals, their interactions with soil components. Soil micro–organisms and their functions, degradation of different insecticides, fungicides and weedicides in soil. Different kinds of synthetic fertilizers (NP & K) and their interactions with different components of soil.
- **Noise:** Source of noise pollution, measurement of noise and Indices, effect of meteorological parameters on noise propagation. Noise exposure levels and standards. Noise control and abatement measurement. Impact of noise on human health.
- **Marine:** Sources of marine pollution and control. Criteria employed for disposal of pollutants in marine system–coastal management.
- Radioactive and Thermal Pollution.
- Introduction to environmental impact analysis.
- Environmental impact Statement and Environmental Management Plan.
- EIA guidelines 1994, Notification of Government of India.
- Impact Assessment Methodologies.
- Generalized approach to impact analysis.
- Procedure for reviewing Environmental impact analysis and statement.
- Guidelines for Environmental audit.
- Introduction to Environmental planning.
- Base line information and predictions (land, water, atmosphere, energy etc.)
- Restoration and rehabilitation technologies.
- Landuse policy for India.
- Urban planning for India.
- Rural planning and landuse pattern.
- Concept and strategies of sustainable development.
- Cost–Benefit analysis.
- Environmental priorities in India and sustainable development.
- Sources and generation of solid wastes, their characterization, chemical composition and classification. Different methods of disposal and management of solid wastes (Hospital Wastes and Hazardous Wastes) Recycling of waste material. Waste minimization technologies.
- Hazardous Wastes Management and Handling Rules, 1989, Resource Management, Disaster Management and Risk analysis.
- Environmental protection–issues and problems, International and National efforts for Environmental Protection, Provision of Constitution of India regarding Environment (Article 48A and 58A).
- Environmental Policy Resolution, Legislation, Public Policy Strategies in Pollution Control, Wildlife Protection Act, 1972 amended 1991, Forest Conservation Act, 1980, Indian Forests Act (Revised) 1982, Air (Prevention and Control of Pollution) Act, 1981 as amended by Amendment Act, 1987 and Rule 1982, Motor Vehicle Act, 1988, The Water (Prevention and Control of Pollution) Act, 1974 as amended up to 1988 and Rules 1975, The Environment (Protection) Act, 1986 and Rules 1986.
- Scheme of labeling of environmentally friendly products (Ecomark), Public Liability Insurance Act, 1991 and Rules 1991.
- Basic elements and tools of statistical analysis; probability sampling, measurement and distribution of attributes; Distribution–Normal, *t* and *x3*, Poisson and Binomial; Arithmetic, Geometric and Harmonic means; moments; matrices, simultaneous linear equations; tests of hypothesis and significance.
- Introduction to environmental system analysis; Approaches to development of models; linear simple

and multiple regression models, validation and forecasting. Models of population growth and interactions—Lotka–Volterra model, Leslie's matrix model, point source stream pollution model, box model, Gaussian plume model.

- Environmental Education and Awareness.
- Environmental Ethics and Global imperatives.
- Global Environmental problems–ozone depletion, global warning and climatic change.
- Current Environmental issue in India.
- Context: Narmada Dam, Tehri Dam, Almetti Dam, Soil Erosion, Formation and reclamation of Usar, Alkaline and Saline Soil.
- Waste lands and their reclamation.
- Desertification and its control.
- Vehicular pollution and urban air quality.
- Depletion of Natural resources.
- Biodiversity conservation and Agenda–21.
- Waste disposal, recycling and power generation, Fly ash utilization.
- Water Crises–Conservation of water.
- Environmental Hazards.
- Eutrophication and restoration of Indian lakes.
- Rain water harvesting.
- Wet lands conservation.
- Epidemiological issues (e.g., Goitre, Fluorosis, Arsenic).

24. NATIONAL CENTRE OF EXPERIMENTAL PETROLOGY & MINERALOGY

National Centre of Experimental Mineralogy and Petrology (NCEMP) is an independent centre of the University of Allahabad established in 1995 dedicated to high pressure-temperature studies, mineral characterization, and synthesis. The NCEMP, UoA, a DST's FIST-sponsored (Level-II) centre, houses the state of the art high-pressure-temperature experimental and analytical national facilities, dedicated to research related to dynamic operative processes in the surface and interior of the Earth and planetary bodies. This centre is one of the 30 high P-T laboratories in the world. The thrust area for research is Experimental Mineralogy and Petrology. Instruments available at NCEMP includes Walker-type Multi-anvil High Pressure apparatus, Toshiba-Tungaloy Piston Cylinder apparatus, Tuttle-type externally heated Hydrothermal apparatus, High Temperature furnaces (up to 1600°C), Petrological and Binocular Zoom microscopes, Fourier Transformation Infra-Red (FTIR), Panalytical X'pert High Score X-ray diffractometer (XRD) and Electron Probe Micro Analyser (EPMA; JEOL JXA 8100 Superprobe operational since 2002).

A Ph.D. in Experimental Mineralogy and Petrology equips scholars with insights into Earth's interior processes, the evolution of its crust, and applications to other planetary bodies. They are highly specialized and possess a unique set of skills that are in demand in various sectors, e.g., in postdoctoral research, academia, mining and oil industries for exploration and resource assessment. Research institutions and governmental bodies hire them for their expertise in understanding earth processes.

🛠 RESEARCH DOMAINS OFFERED AT THE CENTRE

Phase-Equilibria Modeling, P-T Mineral Stability, Rheological Properties, Gem Synthesis and Enhancement, Electrical and Elastic Properties, Silicate Liquids and Trace Elements, Rare Earth Garnets, Super-Hard Materials, Crustal and Mantle Structure, Melt Inclusions, Carbon Sequestration.

🕮 SYLLABUS FOR CRET LEVEL-1 IN EXPERIMENTAL MINERALOGY & PETROLOGY

- **Thermodynamics:**

Introduction to equilibrium thermodynamics, laws of thermodynamics, internal energy, heat capacity, enthalpy, and entropy. Phase rule, derivation, Components, and species, Duhem's equation. Gibbs free energy and chemical potential, Le Châtelier's Principle, fugacity, and activity, Raoult's law and Henry's law, ideal and non-ideal solutions, equilibrium constant, Clapeyron equation, Principles of geothermobarometry, aqueous solutions and solubility equilibria, activities of ionic species, construction of Eh-pH diagrams. Thermodynamic Evaluation of phase diagrams, phase equilibria, Introduction to phase diagrams, Unary, binary, and ternary phase diagrams, Molar phase diagrams, Schreinemakers' rules, thermo-dynamic properties of minerals and fluids. Types of diffusion, buffers. Rocks as chemical system, intensive and extensive variables, closed and open systems.

- **Mineralogy:**

Classification of rock-forming silicates, oxides, carbonates, phosphates, sulphates, sulfides, and other mineral groups. Physical, chemical, and optical properties of minerals. Construction of polarizing microscope. Isotropic and Anisotropic mineral: Plane polarized and cross-polarized properties of minerals such as pleochroism, relief, habit, refractive index measurement, 2V, uniaxial and biaxial crystals, Indicatrix, Interference figures, etc. The concept of a lattice and description of crystal, crystal structure and its morphology. Crystal growth and aggregation, Isomorphism, polymorphism, and crystalline defects.

Symmetry operations, polytypism. Mineral spectroscopy and its applications. Silicon tetrahedron and classification of silicates, study of structures of the different groups of rock forming minerals. Mineral physics, tensors of different ranks, density, thermal conductivity, thermal expansion, and specific heat, elastic properties, piezoelectricity and pyroelectricity, magnetic properties of minerals. Gemology, Gem stones and their formation; basic properties, hardness scale. Gem identification, colour and causes of colour in gemstones. Basics of Geo-Ceramics.

- **Petrology:**

Mantle dynamics, mantle convection, and generation of primary magmas. Igneous rock associations. Viscosity, diffusion, crystal growth, elastic properties of magma. Phase rule and one-, two-, three- and four-component systems. Magmatism and global tectonic processes, geochemical characteristics of igneous rocks as petrogenetic proxies. Magmatism at different tectonic settings e.g., Mid-Oceanic ridges, island arcs, active-continental margins, back-arc basins, Oceanic Island basalts, Continental Flood Basalts, continental rift zone magmatism. Deccan volcanic provinces and tholeiitic basalt.
Transient geotherm and pressure-temperature regimes, heat flow, tectonic context of metamorphic transformations. Composition-space, Cartesian and Barycentric projections, pseudo-component diagrams, thermodynamic principles of metamorphic reactions, exchange vectors. Concept of zones, isograds, metamorphic facies and facies series. Combinatorial formula and Schreinemakers rules, mineral formula calculation, geothermobarometry, concept of petrogenetic grid, pseudosections and construction of P-T-t paths. High P-T metamorphism, granulite, eclogite and migmatite formation, anatexis and granite system (The Haplogranite System Qz-Ab-Or), melt inclusions, and shock metamorphism.

- **Experimental Deep Earth Processes:**

Introduction to experimental geophysics. Physical parameters and mineralogical variation inside the earth surface. Rock and Mineral magnetism properties. Gravity and seismic properties of Earth. Seismicity (P-wave S-wave) experiments.
Thermal conductivity of the rocks. Rheology in the Earth's interior and experiments related to viscosity and rheology.

- **Economic and Industrial Mineral Sciences:**

Magmatic and hydrothermal ore-forming processes. Black smokers, White smokers. Origin of industrial minerals and rocks, cycles of principal elements of industrial materials in nature, Deposits of industrial minerals and rocks, crustal evolution and metallogenesis, metallogeny through time, Plate tectonics and ore deposits. Indian mineral deposits, genesis of important metallic and non-metallic deposits in India. Methods of prospecting and exploration of deposits of industrial raw materials, Laboratory investigations, Exploitation and dressing of industrial minerals and rocks.

- **Planetary geosciences:**

The terrestrial planets, Earth-Moon-dynamics, Ice and rocky-ice moons, dwarf planets, moons of other planets, asteroids, comets. Magmas, magmatism on the earth, planetary volcanism and eruptive styles, petrologic comparisons, and magmatic evolution. Meteorites, impact cratering, terrestrial craters, cratering mechanics. Climate crisis, carbon cycle, types of carbon sequestration and controlling chemical reactions. Basic understanding of Geopolymers, aerogels, high-temperature ceramics, metakaoline. Basics of superconductors.

25. DEPARTMENT OF FAMILY AND COMMUNITY SCIENCE *(HOME SCIENCE)*

The Department of Home Science, established in 1945 in pre-independent India, aimed to empower Indian women. Prof. Sangita Srivastava, the Honorable Vice-Chancellor of the University of Allahabad, led the department for an extended period. After being combined with the Department of Biochemistry, it become an independent department in 2000. A new Home Science wing was constructed in 2007. Presently, the department hosts 29 research scholars, focusing on different fields of family and community sciences. Additionally, the department actively participates in community development programs.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Apparel, Dyeing, Printing, Weaving, Finishing, Fortified Food Product Development, Clinical Food Material Research via animal models, and community-based human nutrition studies domains related to Food Processing Nutritional Science.

🕮 SYLLABUS FOR CRET LEVEL-1 IN FOOD & NUTRITION/EXTENSION EDUCATION/HUMAN DEVELOPMENT

Chemistry of Macronutrients, Introduction to metabolism: Catabolism and anabolism, Role of enzymes in metabolism, Carbohydrate metabolism: Energy from dietary carbohydrate through Glycolysis, Tricarboxylic Acid cycle, Utilization of glycogen, Gluconeogenesis, Significance of Pentose phosphate pathway and glucuronic acid pathway, Photosynthesis, Utilization and storage of dietary carbohydrates. Lipid metabolism: Introduction to Lipids as energy sources, β oxidation, Biosynthesis of fatty acids.
Utilization and storage of body fat. Protein Metabolism: transamination and deamination, essential and non-essential amino acids, nitrogen excretion and the urea cycle. Biosynthesis of some important nitrogen compounds, amino acid oxidation, Body protein synthesis and breakdown. Electron transport chain and oxidative phosphorylation, Formation of ATP. Integration of biochemical pathways, Overview of Food to Energy conversion, Hormones as regulators of biochemical pathways

- **Normal Human Nutrition**

Body composition, Energy Requirements, Basal Metabolic requirements, activity, growth. Measurement Recommended allowances, Critical evaluation of Recommended Dietary Allowances Food Groups, Balanced diet. Nutritional Assessment and Methods of identification of Nutritional Problems Types, Functions, Dietary sources, Requirements and Storage of Carbohydrates, proteins, fats, vitamins, minerals, fibre and water in human body, Regulation of food intake, nitrogen balance, protein quality, amino acid requirements and amino acid imbalance Nutrient adaptation to low intake of energy and protein Inter-relationship between vitamins, minerals and hormones.

- **Human Physiology**
  - **Physiological Principles:** Cell structure and function, body fluid compartments, transport mechanisms, homeostasis and feedback control systems. General organization of the **Nervous system:** Sensory and motor nerves, major levels of nervous system function, Central and autonomic nervous systems, transmission of nerve impulse, synapse, neurotransmitters. Digestion and absorption in the gastrointestinal tract: digestion and absorption of carbohydrates, fats and proteins, Gastrointestinal hormones. Blood: Composition of blood, functions of blood constituents, hemostasis, blood transfusion and tissue transplant.
  - **Circulatory system:** Pumping of heart, Cardiac cycle, ECG, Blood pressure. The immune response: Humoral, cell-mediated. Factors affecting vaccinations Regulation of acid-base balance: Role of buffers in blood, respiratory control, renal controls.
  - **Transport and exchange of respiratory gases:** oxygen and carbon dioxide
  - **Urine formation:** Principles. Effect on body fluids.

- **Elements of Reproductive physiology:** Sex hormones. Breast milk production and its role in contraception.
- **Principles of endocrinology:** Chemical control of metabolism. Adrenaline. Thyroid hormones. Control of water and electrolyte metabolism. Calcium metabolism. Prostaglandins. Endorphins and enkephalins. Renin-angiotensin system.

- **Dietetics and Therapeutic Nutrition**

Nutritional requirements during: Pregnancy, lactation, Infancy, Childhood, Adolescence, Geriatric group, laborers and athletes.
Nutrition for weight management: Underweight, Overweight and obesity.
Therapeutic nutrition- Its importance and scope: Therapeutic adaptation of normal diets, Dietary Modifications- soft diets, liquid diets, enteral and total parenteral nutrition, other therapeutic diets.
Etiology, metabolic aberrations, clinical manifestations, complications, dietary management and counseling for: Febrile conditions such as viral fevers, typhoid and tuberculosis. Gastrointestinal diseases such as diarrhoea, constipation, flatulence, peptic ulcer. Malabsorption syndromes: Colic disease, tropical sprue. Lactose intolerance. Diabetes: NIDDM. IDDM, Cardiovascular diseases: atherosclerosis, hyperlipoproteinemi, congestive heart failure, myocardial infarction, hypertension. Renal diseases: nephrotic syndrome, acute glomerulonephritis, acute renal failure,
chronic renal failure. Biliary diseases: of the liver: hepatitis, cirrhosis. hepatic coma, of gallbladdar: gall stones/cholelithiasis, of the pancreas: pancreatitis.

- **Community Health and Nutrition**

Concept of community. Community development. Social and cultural perspectives in relation to food preferences and health.
Nutritional epidemiology: Birth rates, mortality rates, morbidity, natality, parity, sex ratio, life expectancy etc., Demographic data. Case control and Cohort studies. Developmental milestones. Gomez and Waterlow classifications of growth. Standard norms for evaluation of growth. Growth charts. Vulnerable or at-risk groups. Nutritional problems of the Indian community: Etiology, Government intervention /combat strategies for: Low birth weight infants, protein-energy malnutrition, kwashiorkor and marasmus. Vitamin A deficiency, Nutritional anemia, Iodine deficiency disorders, Endemic flourosis, Lathyrism.
Community Nutrition Services: Role of National Nutrition Monitoring Bureau, National Sample Survey in assessment of geographical distribution of dietary patterns in India. National and International Services. Immunization and Supplementary feeding programs.
Nutrition Education: Objectives. Channels, Methods and Evaluation of Communication.
Food Production in relation to needs of the country. Food security. Food economics. Food surveillance: Food hygiene. Food adulteration and Food Toxins. Epidemic dropsy, botulism, ergotism. Legislation & Quality control regarding food.
Global perspectives in malnutrition: Global environmental problems: Global warming and its impact on agriculture.

- **Food Science**

Food Science: Concept and Scope.
Food preparation: Basic terminology of cooking methods, chemical, physicochemical and microbiological effects of heat on food constituents.
Sensory evaluation of food. Food laws and regulations.
Effects of cooking, processing, and storage on nutrients in: Cereals, Pulses, Fruits, Vegetables, Role of Food Additives in food preparation: Anti-oxidants. Coloring agents. Curing agents. Emulsifiers. Flavoring agents. Leavening agents. Nutrient supplements. Sweeteners. pH controllers. Preservatives. Other additives.
Food toxins: Naturally occurring Toxins- trypsin inhibitors, hemagglutinins, lathyrogens, aflatoxins, saponins, cyanogens, gossypol, glucosinolates, etc.
Methods of improving Nutritional quality of foods: germination, fermentation, supplementation, fortification.
Food preservation: Causes of food spoilage, principles of food preservation, methods of food preservation.
Food packaging: basic concepts.
Food adulteration: Definition, common adulterants in different foods, contamination, methods of detection.
Milk and milk products, Meat, fish and poultry, Sugars and Beverages.

- **Biochemistry of Health and Diseases**

Assessment of health and diseases: Biochemical tests in assessment of health and nutritional status. Analytical factors affecting results of biochemical tests.
Significance of commonly measured analytes: Blood cells, plasma proteins, ions, enzymes, proteins, lipids and lipoproteins, major metabolites such as urea, hormones, acid-base balance, gases in blood in assessment. Merits and demerits of various methods.
Assessment of sub-clinical and clinical nutrient deficiencies: Biochemical indices of thiamine, riboflavin, niacin, vitamin A, iron, calcium, and other nutrient status. Blood and urine analysis.
Assessment of diseases such as diabetes, major genetic diseases such as phenylketonuria.
Non-invasive methods for assessment: Radiological, Bone mineral density, ECG, EEG, NMR. Biochemistry of starvation: Alternate methods of energy generation, organ interrelationships during starvation, acid-base balance, ketosis.
Regulation of Food Intake: Adipose tissue metabolism: White and brown adipose tissue. Lipolysis, reesterification. Lipoprotein lipase.
Lipoprotein metabolism: Metabolism of chylomicrons, VLDL and IDL, HDL, LDL. Formation of atherosclerotic plaque. Effects of dietary and other factors.
Alcohol Metabolism: As a source of energy. Fatty liver and cirrhosis.
Genetic controls in the body: Storage of genetic information. Its implications for disease. Oncogenes and cancer. Carcinogens and mutagens in food. Role of polymerase chain reaction in diagnosis.
Free Radicals and anti-oxidants: Formation and harmful effects of free radicals.
Defence against free oxygen species. Role of anti-oxidant enzymes, vitamins and other free radical scavengers. Biochemistry of stress.

- **Applied Nutrition**

Nutrition for Health and Fitness:
Nutrition in eating disorders. Anorexia Nervosa, Bulimia.
Nutrition for exercise and sports performance. Energy production. Nutritional requirements for optimum performance. Ergogenic aids. Carbohydrate loading.
Nutrition for bone health.
Role of nutrition in skin and hair care: Cosmetic effects of diet. Cellulite. Allergies. Anti-aging foods. Foods as cosmetic agents.
Maternal and Child Nutrition:
Growth and development of fetus: Effects of maternal nutrition on birth weight.
Appropriate-for-gestational-age. Low birth weight (LBW), small-for-date (SFD), premature babies. Nutritional management of high-risk and low-risk pregnancies.
Malnutrition and mental development. Critical periods of brain development.
Nutrition and immunity: Basics of immunity. Nutrition in infections. Immunity in varying nutritional states.
Drug-nutrient interrelationships: Effects of drugs on nutrient absorption and utilization, effects of foods and nutrients on drug utilization. Effects of nutritional state on drug metabolism.
Scientific evaluation of food-related beliefs: Fads. Application of research methodology to test claims of efficacy of foods used in alternative systems of medicines: ayurvedic, herbal and home remedies.

- **Microbiology of Food and Disease**

Introduction to microbes: Bacteria, Fungi, Algae, Viruses.
Sources of Food contamination: Air. Water. Soil. Sewage. Post-processing. Food spoilage: Food borne illnesses. Causes and prevention.
Food toxins: Toxins in the food chain
Environmental contaminants: Pesticides, insecticides, untreated sewage in food.
Causes and prevention. Contamination of water. Analysis and treatment. Public water supply: Sources, regulations, contaminants.
Consumer Protection: Consumer concerns about food and water. Food safety and sanitation Microbes and the production of foods and beverages: Role of microbes in production of milk products, pickled foods, fermented foods, bakery products, alcoholic beverages.
Microbes in diseases: Causes and prevention of: Infectious intestinal diseases, Bacterial diseases of the digestive tract, viral infections.
Biotechnology applications: Diagnosis of diseases, medical therapy, vaccines.

- **Biochemical Correlates of Nutrition Therapy**

Advances in Nutrition Therapy of selected disease states: Biochemical basis of dietary modifications. Biochemical evaluation of efficacy of dietary changes.
Complications. Short term and long-term controls in the diseases such as Diabetes Mellitus, Cardiovascular diseases, Renal diseases, Obesity.
Nutritional management of: Food allergies. Selected diseases of genetic origin such as phenylketonuria, Gout.
Critical care for conditions of metabolic stress: Sepsis, Trauma, Burns and Surgery.
Nutrition and Cancer: Effects of cancer on nutritional requirements. Effects of food on incidence of certain cancers. Carcinogenic foods. Foods that prevent cancer.
Food and Endorphins: Alteration of mental states by food.

- **Institutional Food Management**

Food Service systems: Introductory concepts. Development.
Types of food services: Hospital, hostel, cafeteria, community kitchens. Planning for food services in hospitals: Physical plant, its location, floor plans, space allowance, kitchen units, storage unit, baking, dishwashing and servicing unit.
Equipment requirement: For food preparation, storage, distribution and serving. Manpower requirement: Personnel management, selection, training and supervision
Food service management: Menu planning, Receipt of food and its storage, principles and techniques in quantity food production. Food service.
Time and energy management:
Financial Management: Principles of accounting, pricing and cost control. Laws affecting food service operations: Food laws. Personnel laws.
Consumer education: Consumer Protection Laws, Consumer concerns.

- **Laboratory Techniques in Human Nutrition**

Principles and introductory concepts of general analytical techniques: Colorimetry and spectrophotometry, Chromatography, Flourimetry, Electrophoresis, Radioisotope methodology, Saturation analysis-radioimmunoassay, ELISA, Microbiological assays, Metabolic balance studies. Collection, handling, transport and storage of biological samples in a field situation: Blood, plasma, serum, urine, feces. Relative merits and demerits.
Methods for food analysis: Estimations of carbohydrates, protein, fat, vitamins and minerals. Methods of assessment of nutritional status: Hematological tests. Nitrogen balance and other metabolic studies. Vitamin load tests. Clinical assessment. Biochemical assessment. Animal experimentation.

- **Methods in research and advanced Statistics**

Scientific Approach to Research: Meaning, significance, types of research studies.
Research Process: Formulating the problem, objectives, hypothesis, research design, sample design, collection of data, analysis of data, interpretation, preparation of report.
Sampling design: Census vs. sample survey. Steps. Types.
Scaling techniques: Continuum, Reliability, Validity, Scale construction techniques.
Methods of data collection: Observation, interview, questionnaire, case study, focus group discussion.
Processing of data: Development of code book. Socioeconomic indicators: Kuppuswamy, Prasad, Kumar and other scales. Consumer price index.
Scientific way of report writing:
Measurements: Measures of central tendency, variability, correlation, chi-square, t-test
Applications of advanced statistics: Analysis of variance (ANOVA). Multivariate statistics: MANOVA, regression. Non-parametric statistics.
Application of research and statistics in Nutritional Surveillance: Code-30–5.

26. CENTRE OF FOOD TECHNOLOGY

The Centre of Food Technology has been established to provide education and training to create human resource capacities for the food processing industry, academic and research institutions in the country. The Centre offers research in areas of food science, food product development, food processing, food technology, food safety, nutrition, health foods, food microbiology, bioprocessing, and food analysis.

🛠 RESEARCH DOMAINS OFFERED AT THE CENTRE

Domains related to Food Processing Nutritional Science.

🕮 SYLLABUS FOR CRET LEVEL-1 IN FOOD TECHNOLOGY

- **Principles of Food Processing**

Introduction of Food Technology - definition, scope and opportunities. Causes of food spoilage, sources of microbial contamination of foods, foodborne illnesses, water activity and its relation to spoilage of food. Spoilage of processed products and their detection. Method of food preservation- heat processing, pasteurization, canning, bottling, drying/dehydration, chilling, freezing, fermentation, irradiation and chemical additives, refrigerated and modified/controlled atmosphere storage, aseptic preservation, hurdle technology, hydrostatic pressure technology, microwave processing etc. Use of nonthermal technologies (micro/ultrafiltration, ultra high voltage electric fields, irradiation, thermosonication), alternate-thermal technologies (ohmic heating, dielectric heating, infrared and induction heating). Various unit operations - size reduction, mixing and forming, separation, extrusion, encapsulation. Mass and energy balance in food processing.

- **Food Chemistry**

Chemistry of water. Classification, structure and properties of carbohydrates, protein & fat. Role of carbohydrates in food industry- sugar, starch, cellulose, glucans, hemicelluloses, gums, pectic substances. Purification and denaturation of proteins. Protein interaction and degradation. Major protein systems and factors affecting them. The nature of proteins derived from milk, egg, meat, oil seed and cereal. Refining of crude oils, hydrogenation and winterization. Vegetable and animal fat, margarine, lard, butter. Frying and shortening. Flavor changes in fats and oils, lipid oxidation, factors affecting lipid oxidation, auto-oxidation, and biological significance of auto-oxidation of lipids. Nature, classification and properties of food enzymes, enzyme activity in different food systems, commercial availability, Immobilization of enzymes, flavour production by enzymes. Role of vitamins and minerals in food industry, effect of various processing treatments and fortification of foods.

- **Instrumental and Laboratory Techniques**

Concept of molar, molal, normal and buffers solutions, measurement of pH. General principles & types of Chromatographic techniques (partition and adsorption chromatography, paper, thin layer, gas-liquid, ion exchange, affinity chromatography, Gel filtration and high-pressure liquid chromatography), Electrophoresis techniques (Paper and gel electrophoresis). Spectroscopy- Beers and Lambert's Law. General principles of colorimeters and spectrophotometers, atomic spectroscopy, emission spectroscopy, IR spectroscopy, flourimetry, flame photometry and atomic absorption spectrophotometry. Use of radioisotopes.

- **Post Harvest Technology & processing of Fruits and Vegetables**

Post harvest handling, and storage of fresh fruits and vegetables. Maturity standards, pretreatments and pre-packaging, refrigerated storage and transportation. Preparation of fruits and vegetables for processing. Minimally processed products. Containers- Tin, glass and other packaging materials used in fruits and vegetables preservations. Canning and bottling: quality of raw materials, preparation of materials, preparation of syrups and brines, canning and bottling, the effect of canning and bottling on nutritive value, spoilage of

canned foods, detection and control. Thermal processing - process time evaluation for canned products, process optimization, aseptic canning, methods for canning of different fruits and vegetables. Dehydration and associated quality changes during drying and storage of hydrated products. Solar drying. Intermediate moisture foods. Preparation and utilization of fruits and vegetables, juice in non-fermented aerated beverages. Chemistry and manufacture of pectin role in gel formation and products like jellies and marmalades. Technology of preserve; pickles, chutneys and sauces. Nature and control of spoilage in these products. By-product utilization of fruits and vegetables processing industry. FPO and related formalities to obtain it. Frozen fruits and vegetables–methods, packaging, storage and thawing. Tomato products-juice, puree, paste, soup, sauce and ketchup. Other convenience foods from fruits and vegetables.

- **Food Microbiology**

Classification and identification of yeasts, molds and groups of bacteria important in food industry. Intrinsic and extrinsic factors influencing growth of microorganisms in foods. Bacterial, yeast and mold cultures (single and mixed cultures), propagation, maintenance and evaluation of cultures; factors affecting the activity of cultures, bacteriophages, residual antibiotics and chemicals. Fermented cereal foods, vinegar, and alcoholic beverages. Spoilage of fresh and processed fruit and vegetables, spoilage of meat, fish, eggs and poultry products. Microbial toxins. Microbial infections and intoxications. Food borne diseases, Investigation and their control.

- **Food Packaging**

Principles in development of protective packaging, terminology, operations, functions. Primary, secondary and tertiary packaging. Different types of paper, paperboard, plastics, cellulose films, metalized films, co-extrusion, lamination, thermo formed semi rigid containers, tin plates, steel, aluminum containers, and glass containers. Material handling, filling, air removal, sealing, retorting, Modified atmosphere packaging, vacuum and gas packaging. Package sterilization techniques, cushioning, unitizing, palletizing, stacking and containerization. Evaluation and testing of Packaging materials. Smart packaging, active packaging, anti-microbial packaging etc.

- **Processing of Cereals, Pulses and Oilseeds**

Structure of different grains like wheat, rice, maize. Milling of Wheat (flour/semolina) and its use in traditional/nontraditional foods like breads, biscuits, cakes, doughnuts, buns, pasta goods, extruded, breakfast and snack foods. Property of dough and its rheology. Milling and parboiling of rice, by-products of rice milling and their utilization. Processed products from rice, pearling, malting, and brewing. Wet and dry milling of corn, manufacture of corn flakes, corn syrup, corn starch, corn steep liquor and germ oil. Structure and composition of pulses and their importance in Indian diet. Milling and processing of pulse - germination, cooking, roasting, drying and fermentation. Protein concentrates and Isolates. Oilseed processing - Production, packaging and storage of vanaspati, peanut butter. Anti-nutritional factors in legumes.

- **Milk and Milk Processing**

Milk processing - Collection, chilling, transportation, cream separation, standardization, pasteurization, sterilization, homogenization, packaging, storage and distribution of fluid milk, ultrahigh temperature processed milk. Preparation of various types of milks - Toned, Double Toned, Sterilized, homogenized, fortified, reconstituted and flavored milk. Principles and practices of manufacturing, packaging and storage of cheese, butter, frozen milk products (Ice-cream, Kulfi), evaporated and dried milk products (Condensed Milk, SMP, WMP), fermented milk products (Dahi, cultured butter milk, acidophilus milk etc.) and indigenous milk products ghee, Khoa, Chhena and Milk based foods). Sanitary aspects of dairy plant building, equipment and their maintenance. Dairy by products utilization. Defects and their control found in cheese, butter, frozen milk product, evaporated and dried milk products.

- **Technology of Meat, Fish and Poultry:**

Chemical composition and nutritive value of Meat. Mechanism of muscle contraction and relaxation. Post Mortem changes – factor effecting post Mortem changes, thaw rigor and cold shortening. Properties of fresh meat. Meat carcass grading and cuts. Restructured meat products, pre-rigor processing of meat. Meat tenderization and its techniques. Preservation of meat and poultry-chilling, freezing, curing, smoking, canning, dehydration, irradiation, freeze drying, antibiotics, microwave, chemicals. Utilization of meat industry by products. Eggs-structure, composition. Poultry-types, factor affecting quality, chemical composition and nutritive value of poultry meat. Poultry dressing – ante and post mortem examination, methods of stunning, slaughter, scalding and dressing.

- **Quality control**

Objectives, importance and functions of quality control. Quality systems and tools used for quality assurance including control charts, acceptance and auditing inspections, critical control points, reliability, recall and liability, The principles and practices of food, plant sanitation. Food and hygiene regulations. Codex Alimentarius, GMP/GHP, HACCP, US-FDA, ISO-9000, ISO-22000 ISO-14000, PFA, FPO, BIS, AGMARK, Food adulteration. Sensory evaluation, selection methods. Quality control of food at all stages & for packaging materials. Quality certification.

- **Research Methodology and Statistics**

Meaning of research, significance of research and types of research studies. Research Process, sampling design, scaling techniques, experimental designs, processing of data. Nature of measurements, types of measurement scale, Frequency distribution, graphical presentation of data. Computation of mean, median and mode, their uses. Computation of mean deviations, Quartile deviation and standard deviation, their uses. Regression, Meaning, Spearman and Pearson's techniques of correlation, linear regression, Chi Square, Tests of significance of difference between means t-test, ANOVA.

27. DEPARTMENT OF ENGLISH AND MODERN EUROPEAN LANGUAGES *(FRENCH)*

The Department of English and Modern European languages, University of Allahabad, has a unique distinction of being one of the oldest English Departments in the country. Established in 1922, it was part of the British plan of westernizing the natives of the land through education, "the white man's burden". As part of that colonial legacy, we still have the S.G Dunn (our first British Head of the Department) memorial gold medal for the undergraduate topper in English. This historical truth and inheritance always gave the Department an elitist character. There were great teachers in this Department who in their own style carried the mantles of Oxford dons that they reflected in the then "Oxford of the East" of which the English Department could be called the truest representative.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Domains related to French.

🕮 SYLLABUS FOR CRET LEVEL-1 IN FRENCH

- **French and Francophone literature**
  - Prose
    French novels and short stories
    Francophone novels and short stories
  - Poetry
    Romanticism, Symbolism, Surrealism
    Francophone Poetry
  - Drama
    Classicism – 17th Century
    Modernism – 19th - 20th Century
- **Linguistics**
  - General linguistics
  - Key concepts
    Langue / Parole
    Diachronic / Synchronic
    Performance / Competence, etc.
- **Didactics**
  - French as a Foreign Language (FLE)
  - Various methodologies and FLE textbooks
- **Translation and Interpretation**
  - Translation theories and practice
  - Translation challenges
  - Simultaneous and consecutive interpretation
- **Culture and Civilization**
  - History of France and Francophone countries
    French revolution (causes – consequences – ideas – events)
    World Wars (in the context of France and French societies)
    The 2nd, 3rd, 4th and 5th Republic
  - Major cultural and social movements and their impact on literature and art
  - Major movements and styles of art and architecture in France

28. INSTITUTE OF GANDHIAN THOUGHT & PEACE STUDIES

Gandhi Bhavan, founded in 1961 at the University of Allahabad, is a pioneering institution dedicated to advancing the principles and philosophy of Mahatma Gandhi. It serves as a catalyst for societal transformation through seminars, symposiums, and academic activities, fostering dialogues on contemporary issues. The institute emphasizes the relevance of Gandhian wisdom in addressing modern global challenges, including climate change and sustainable development. With a commitment to empowering India's youth, it cultivates social and emotional learning, encouraging inter-generational discourse and holistic problem-solving. The institute's rich legacy, marked by notable visitors and a dedicated library, exemplifies Mahatma Gandhi's vision, while Professor Santosh Kumar Bhadauria currently leads the institution.

🛠 RESEARCH DOMAINS OFFERED AT THE INSTITUTE

The fields related to Gandhian Studies and Peace Studies.

🕮 SYLLABUS FOR CRET LEVEL-1 IN GANDHI AND PEACE STUDIES

- **Primary Introduction of Mahatma Gandhi:**

Family History of Mahatma Gandhi
Childhood and education in India and England
Impact of her mother's Religions view & other religious thinkers.

- **Mahatma Gandhi in South Africa:**

Gandhi as a civil right lawyer,
Impact of Train Incident.
The origin of Satyagraha
Movement against Racial discrimination, injustice and exploitation
Gandhi & other thinkers: Leo Tolstoy, John Ruskin, Henry David Thoreau, Pritam, Gokhle etc.

- **Socio–Political & Religious Thoughts of Mahatma Gandhi:**

Caste System and Varna ashram Dharma
Untouchability, Social inequalities, Question of Harijans.
Social Justice, Morality
Women's Problems and Empowerment

- **Philosophical Thoughts of Mahatma Gandhi:**

Truth, God as Truth,
Violence & Non- Violence,
Satyagraha and satyagrahi,
Purity of End and Means
Dignity of Labor & and Bread Labor

- **Mahatma Gandhi's Views on Modernization and Technology:**

Hind Swaraj as Political manifesto
Human vs Technology, Aims of Technology
Western civilization as morally corrupt civilization
Technology & civilization
Technology Mechanization as form of violence

- **Mahatma Gandhi's views on State and Democratic tradition:**

Gram Swaraj, Panchayat Raj, Decentralization

Parliamentary Democracy, Sovereignty, Freedom,
Human Rights and Duties.
Spiritualization of politics & morality in politics

- **Mahatma Gandhi's views on Economics& his basic ideals:**

Critique of Modern Western Civilization, Labor – Capital Relations
Trusteeship, Shared Ownership, Small Cottage Industries
Constructive Programme and Sustainable Development.

- **Mahatma Gandhi's Role in Freedom Movement:**

Champaran, Non-Cooperation
Kilafat Movement Ahmedabad Mill Strike, Dandi March
Civil Disobedience movement, Bardoli, KhedaSatyagrahas, Vykom Satyagraha and Quit India Movement.
Gandhi and Partition of India.

- **TheoriesofPeace and Conflict Resolution:**

Meaning, nature and theories of Peace, Positive Peace by Johan Galtung, Stable Peace by Kenneth E. Boulding, Just Peace by John Paul Lederach, Many Peace by Wolfgang Dietrich, Perpetual Peace by Immanuel Kant, Democratic Peace by Michael W. Doyle, Justice and Capability
Approach by Amartya Sen and Martha Nussbaum; Approaches to Peace, the Culture of Peace, Peace education.
Nature, source and types of Conflict, Approaches to the study of Conflict, Theories of conflict; Evolution of Peace and Conflict Studies and its present status; The goal of Conflict Management, responses to conflicts and methods of conflict management; Principles and techniques of Conflict Management.

- **Indian Perspective on Peace and Conflict:**

Vedic Perspective, Jainism and Buddhism, Gandhi on Peace as Truth and Ahimsa; understanding Peace in terms of Harmony, Tolerance and Forgiveness

- **Major Global Conflicts and United Nations (UN):**

Concepts of War- strategies, tactics, campaigns and battles , theories of causes of War in International Relations; Idealist, realist and Marxist view of War, the Just War; types of War- limited, total, bio chemical, nuclear, Guerrilla, Insurgency; Sources of War; Case Studies- WW-I, WW-II, Korean War, Vietnam War, Balkan War, Afghan War; UN- Principle, foundation and objectives; Structure and function of UN General Assembly, Security Council, Economic and Social Council, Secretary General and Secretariat, ICJ, ILO, UNESCO(Peace Education and Culture of Peace), WHO, UNICEF, UNDP, UNEP, UN WOMEN, UNHCR, MDGs, SDGs

- **Peace Movements:**

Anti-War Movement (Opposition to the Vietnam War), Mahatma Gandhi's Satyagrah Movement, American Civil Rights Movement by Martin Luther King (Jr.), Anti-Apartheid Movement by Nelson Mandela

- **Strategies of Peace-making:**

Peace-keeping, Peace-making, Peace-building and Peace Enforcement; Approaches- Facilitation, Mediation, Arbitration; Process- Humanitarian aid, Negotiations, Humanitarian Intervention, Responsibility to protect (R2P)

- **Human Security and Human Rights:**

Defining Human Security in terms of Human Development, Peace Education and Peace building, threats to Human security; Violence- Structural, Direct, Cultural, Terrorism, State violence, Natural hazards; Human Rights- meaning, scope, UN Charter, International Covenant on Civil and Political Rights ICCPR, International Covenant on Economic Social and Cultural Rights ICESCR; Human Rights in India- legal and constitutional provisions, National and State Human Rights Commission

29. DEPARTMENT OF GEOGRAPHY

The department of Geography was founded in 1937 through the efforts Prof. R. N. Dubey, who later became the first professor & Head of the Department. Undergraduate study started immediately and the Post-Graduate study was started in 1946. The Geographers from the Department of Geography, University of Allahabad founded two national societies i.e. Allahabad Geographical Society & Indian Institute of Geomorphologists (IGI).

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Geomorphology, Agro-Industrial Regions, Regional Development Disparities and Planning, Voting Pattern & Electoral Behavior, Quality of Life/Welfare Issue, Population and Development, Environment & Sustainable Development, Neo–Tectonic , Urban Environment, Ground Water Exploration, Tourism Geography, Disaster Management, Agro-Climatic Regions, Arid Land Studies , Climate Change, Application in Remote Sensing & GIS.

🕮 SYLLABUS FOR CRET LEVEL-1 IN GEOGRAPHY

- **Geomorphology:**

Fundamental concepts; Factors controlling landform development; Endogenetic and Exogenetic forces; Denudation process; weathering and erosion, Geosynclines, mountain building, continental drift and plate tectonics; Concept of Geomorphic Cycle; Landforms associated with fluvial, glacial. Arid coastal and karst cycles, Slope forms and processes; Environmental and Applied Geomorphology.

- **Climatology:**

Composition and structure of the atmosphere, Insulation; Heat budget of the earth; Distribution of temperature, atmospheric pressure and general circulation of winds; Monsoons and jet streams; Stability and instability of the atmosphere; Air– masses; Fronts temperate and tropical cyclones; Types distribution of precipitation; Classification of world climates, Kroppen's and Thornthwaite's schemes; Hydrological Cycle; Global warming.

- **Oceanography:**

Origin of ocean basins; Bottom relief of Indian. Atlantic and Pacific Ocean; Ocean deposits; Coral reefs; Temperature and salinity of the Oceans; Density of sea water; Tides and ocean currents; Sea–level changes.

- **Bio–Geography:**

Physical factors influencing world distribution of plants and animals; Forms and functions of ecosystem: Forest, grassland, marine and mountain ecosystems; Bio–diversity and its depletion through natural and man induced causes; Conservation and management of ecosystems; Environmental hazards and problems of pollution; Ozone depletion.

- **History of Geographic Thought:**

General character of Geographic knowledge during the ancient and medieval period; Foundations of Modern Geography: Contribution of German, French, British and American schools; Conceptual and methodological developments during the 20th century; Changing paradigms; Man and Environment, determinism and possibilism, a real differentiation and spatial organization; Quantitative revolution; Impact of positivism, humanism, radiacalism and behaviouralism in Geography.

- **Population Geography:**

Nature Scope, subject matter and recent trends; Patterns of world distribution, growth and density of population; Policy issues; Patterns and processes of migration; Demographic transition; Population–

resource regions.

- **Settlement Geography:**

Site, situation, types, size, spacing and internal morphology of rural and urban settlements; Ecological processes of urban growth; Urban fringe; City– region; Settlement systems; Primate city; Rank–Size rule; Settlement hierarchy; Christaller's Centarl Place theory; August Losch's theory of market centres.

- **Economic Geography:**

Location of economic activities and spatial organization of economics.

- **Classification of economics:**

Sectors of Economy: primary, secondary, tertiary and quaternary; Natural resources: Renewable and non–renewable; Conservation of resources.

- **Agricultural Geography:**

Concept and techniques of delimitation of cultural regions; Measurement of agricultural productivity and efficiency; Crop combinations and diversification; Von Thumen's Model; Agricultural systems of the world.

- **Industrial Geography:**

Classification of industries: Weber's and Losch's approaches; Resource based and footloose industries.

- **Geography of Transport and Trade:**

Models of transportation and transport cost; Accessibility and connectivity: Inter–regional and Intra–regional: Comparative cost advantages.

- **Political Geography:**

Definition and scope of Political Geography; Geopolitics; Global strategic views' (Heartland and Rimland theories); concept of nation, state and Nation– State; Boundaries and frontiers; Politics of world resources; Geography and Federalism.

- **Social Geography:**

Nature and scope of social geography; Social structure and social processes; Elements of Social Geography ethnicity, tribe, dialect, language, caste and religion; Concept of Social well–being.

- **Cultural Geography:**

Nature and scope of Cultural Geography; Environment andculture; Concept of culture–areas and cultural regions; Theories of tribal groups; Dwelling places as cultural expressions.

- **Regional Planning:**

Regional concept in Geography; its application to planning; Concept of planning region; Regional hierarchy; Types of regions and methods of regional delineation; Conceptual and theoretical framework of regional planning; Regional planning in India: Concept of development; Indicators of development; Regional Imbalances.

- **Geography of India:**

Physiographic divisions; Climate: Its regional variations; vegetation types and vegetation regions; Major soil types; Coastal and Marine resources; Water resources; Irrigation; agriculture; Agro climatic regions; Mineral and power resources; Major industries and industrial regions; Population distribution and growth; Settlement patterns; Regional disparities in social and economic development.

- **Cartography:**

Map as a tool in Geographical studies; Types of maps, Techniques of the study of spatial patterns of distribution; Single purpose and composite maps; Choropleth Isopleths and Chorochromatic maps and pie diagrams; Mapping of location specific data; Accessibility and flow maps. Remote sending and computer application in mapping; Digital mapping; Geographic Information System (GIS): Thematic maps

- **Statistical Methods:**

Data sources and types of data: Statistical diagrams; study of frequency distribution and cumulative frequency; Measures of central tendency, Selection of class intervals for mapping; Measures of dispersion and concentration; Standard deviation; Lorenz curve; Methods of measuring association among different attributes Simple and multiple correlation.

Regression. Measurement of spatial patterns of distribution; Nearest–neighbour–analysis; Scaling techniques, rank score, weighted score; Sampling technique for geographical analysis.

30. DEPARTMENT OF ENGLISH AND MODERN EUROPEAN LANGUAGES *(GERMAN)*

The Department of English and Modern European languages, University of Allahabad, has a unique distinction of being one of the oldest English Departments in the country. Established in 1922, it was part of the British plan of westernizing the natives of the land through education, "the white man's burden". As part of that colonial legacy, we still have the S.G Dunn (our first British Head of the Department) memorial gold medal for the undergraduate topper in English. This historical truth and inheritance always gave the Department an elitist character. We have had our share of brown sahibs walking the portals of the grand Edwardian Mughal structure (with Rajasthani artefacts) that houses us till date. There were great teachers in this Department who in their own style carried the mantles of Oxford dons that they reflected in the then "Oxford of the East" of which the English Department could be called the truest representative.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Fields related to German

🕮 SYLLABUS FOR CRET LEVEL-1 IN GERMAN

- **Literature:**

German language literature from Germany, Austria and Switzerland from beginning to present, Philosophical Foundations of German language literature (From Kant to Habermas)

- **History and Culture:**

Art, Culture, History, Politics and Media of German speaking countries

- **Linguistics:**

Language Philosophy, Important Terms and Principles of Linguistics, Core and Applied Branches of Linguistics

- **Didactics:**

German as Foreign Language, Literature Didactics and new Media

- **Translation:**

Theories, Practice, Philosophy and Problems of Translation

31. DEPARTMENT OF HINDI

Department of Hindi was established in 1924. First Head of Department, Dr. Dhirendra Verma, with cooperation of his colleagues prepared the syllabus in such a form that in higher education scientific knowledge of Hindi Language & Literature might be provided to the students. Dr. Uday Narain Tiwari, Dr. Hardeo Bahri -- these are the names, well-known in the field of linguistics. Dr. Mata Prasad Gupta was especially devoted to textual criticism. Dr. Brajeshwar Verma was authentic scholar of Surdas, Dr. Paras Nath Tiwari of Kabirdas and Dr. Dharmvir Bharati were also attached with the Department for some time. The department, from the very beginning, has been a centre of learning and creativity in Hindi. We are carrying on this tradition onward.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Aadi Kavya, Bhakti kavya and Ritikavya, Modern Hindi Poetry, Hindi Criticism, Aesthetics and Literature, Linguistics , Hindi Journalism , Post Colonialism and Hindi Literature , Identity Discourse (Feminism, Dalit, Adivasi, LGBTQ, etc.), Hindi Fiction , Hindi Non-Fiction (Memoir, Travelogue, Autobiography, Biography etc.), History of Hindi Literature, Functional Hindi, Translation, Modern Indian Languages

🕮 SYLLABUS FOR CRET LEVEL-1 IN HINDI (हिन्दी पाठ्यक्रम)

1. **हिन्दी भाषा व साहित्य और इतिहास**

(क) हिन्दीभाषा का इतिहास

- अपभ्रंशअवहट्टपुरानीहिन्दी का स्वरूप और भाषिक विशेषताएँ।
- आधुनिक आर्य भाषाओं में हिन्दी का स्थान।
- हिन्दी की उपभाषाएँ–राजस्थानी, पहाड़ी, पश्चिमीहिन्दी, पूर्वीहिन्दीआदि का संक्षिप्तपरिचय।
- हिन्दी–प्रमुख बोलियाँ–अवधी, ब्रज, खड़ीबोली, भाषिक, परिचय एवंकाव्यभाषा के रूपमें।
- हिन्दी के विविध रूप–सम्पर्क, राजभाषा, राष्ट्रभाषा।
- देवनागरी लिपि, इतिहास एवं विशेषताएँ।
- कम्प्यूटरऔरहिन्दी।

विकास

(ख) साहित्य का इतिहास :

- प्रमुख साहित्येतिहासकारों की इतिहासदृष्टि।
- काल के विभाजन का आधार।
- आदिकालीनहिन्दीसाहित्य की सांस्कृतिकप्रवृत्तियाँ, लौकिक एवं धार्मिककाव्य।
- भक्तिकाल–भक्तिआन्दोलन का समाजशास्त्रीय आधार।
- निर्गुण एवंसगुणभक्तिकाव्य साम्य–वैषम्य।
- निर्गुणकाव्य– संत काव्य, सूफी, प्रेमाख्यानककाव्य–विशेषताएँ एवंसांस्कृतिकप्रदेय, सगुणभक्तिकाव्य, रामभक्तिकाव्य, कृष्णभक्तिकाव्य, भक्तिकाव्य औरसामाजिकसमन्वय, भक्तिकाव्य औरलोकभाषा।
- आधुनिककाल–आधुनिकता का तात्पर्य, भारतेन्दु युग, द्विवेदी युग, छायावाद, छायावादोत्तर, प्रगतिवाद, प्रयोगवाद, नयीकविताआदि की साहित्यिकप्रवृत्तियाँ एवंउपलब्धियाँ।
- रीतिकाव्य–रीतिबद्ध, रीतिसिद्ध एवंरीतियुक्तकाव्य, रीतिकालीनसर्जनात्मकपरिवेश, रीतिकाव्य की

उपलब्धियाँ एवंसीमाएँ, रीतिकालीनविविध काव्य काव्य प्रवृत्तियां।

- गद्य की विधाओं का विकास–निबंध, कहानी, उपन्यास, नाटक, आलोचना, आत्मकथाआदि।

2. **निम्नलिखितरचनाओं की काव्यगतविशेषताएँ एवंसाहित्यिकप्रदेय**

- सरहपा, अमीर खुसरो, विद्यापति, कबीर, रैदास, नानक, जायसी, तुलसी, सूरदास, केशवदास, घनानंद, बिहारी, भारतेन्दु, मैथिलीशरणगुप्त, प्रसाद, निराला, महादेवीवर्मा, सुमित्रा नंदनपंत, दिनकर, नागार्जुन, अज्ञेय, मुक्तिबोध, सर्वेश्वरदयाल, रघुबीरसहाय, नरेशमेहता, अशोकवाजपेयी, धूमिल, समशेरबहादुर, अरुणकमल, राजेशजोशीआदि।

3. **निम्नलिखितरचनाओं की व्याख्या तथाआलोचना**

- कबीरग्रन्थावली, श्यामसुन्दरदासआरम्भ से 30 पद, साखी–सतगुरु कौ अंग, सुमिरनभजनकौ अंग, परचाकौ अंग, विरहकौअंग।
- जायसीकृतपद्मावत–सिंहल द्वीप, मानसरोवर एवंनागमतीविरहवर्णन।
- सूरदास–भ्रमरगीत, आरम्भ से 50 पद।
- तुलसीदास–रामचरितमानस उत्तरकाण्ड।
- बिहारी–बिहारीसतसई के आरम्भिक 150 दोहे (पाठ बिहारी रत्नाकर)
- निराला–राम की शक्तिपूजा, सरोजस्मृति, अधिवास, कुकुरमुत्ता, वहतोड़तीपत्थर।
- प्रसाद–कामायनीः चिन्ता, श्रद्धा, इडा
- नरेशमेहता–संशय की रात
- मुक्तिबोध–ब्रह्मराक्षस
- धूमिल–पटकथा
- प्रेमचंद–गोदान
- फणीश्वरनाथरेणु–मैलाआँचल
- भारतेन्दु–भारतदुर्दशा
- प्रसाद–स्कन्दगुप्त, ध्रुवस्वामिनी
- मोहनराकेश–आषाढ़ का एकदिन

सहित्य शास्त्र एवंआलोचनाभारतीय काव्यशास्त्र के विभिन्नसम्प्रदाय

रस, ध्वनि, वक्रोक्ति, अलंकार, औचित्य हिन्दी के प्रमुख आचार्य एवंउनकाप्रदेय–अरस्तू का विरेचनसिद्धान्त, अनुकरणट्रैजिडी।

स्वच्छन्दतावादीआलोचना के प्रतिमान–

क्रोंचे के सौन्दर्यदृष्टितथाकाव्य दृष्टि, नईसमीक्षा, समकालीनआलोचना उनके सिद्धान्त–रोलावार्थ, देरिदा, संरचना, पाठऔरविच्छेद, विमर्शकेन्द्रितआलोचना– स्त्री विमर्श, दलितविमर्श, संस्कृतिविमर्श, हिन्दीआलोचना की आलोचनादृष्टि–बालकृष्ण भट्ट, महावीरप्रसाद द्विवेदी, रामचन्द्र शुक्ल, हजारीप्रसाद द्विवेदी, नन्ददुलारेबाजपेयी, नगेन्द्र, रामविलास शर्मा, नामवर सिंह, रामस्वरूपचतुर्वेदी।

32. FACULTY OF LAW

The Law Department at Muir College was established in 1872 and initially housed in a beautiful building constructed around 1910, thanks to donations from the Oudh Bar Association. However, this building lacked sufficient space for the expanding Law Library and mandatory LL.B. tutorials. In 1980, the department relocated to a new building in the Chatham Lines campus, funded by UGC grants, with the foundation stone laid by Law Minister A.K. Sen in 1965. Before 1955, the Head of the Law Department also served as the Dean. The department maintained a close relationship with the High Court, appointing part-time professors and readers from the High Court Bar, with notable legal figures serving in various capacities.

🛠 RESEARCH DOMAINS OFFERED AT THE FACULTY

Domains of legal studies.

🕮 SYLLABUS FOR CRET LEVEL-1 IN LAW

- **Constitutional Law of India**

Preamble and Essential Features of the Indian Constitution
Distribution of Legislative Powers between Union and States Fundamental Rights,
Fundamental Duties and Directive Principles of State Policy Judiciary, Executive
Parliament and State Legislatures Amending Process of the Constitution Writ Jurisdiction

- **Jurisprudence**

Sources of Law Schools of Law, Legal Personality
Theories of Punishment Rights and Duties
Concept of Possession and Ownership
Judicial Contribution in Bringing Social Changes Law and Morality

- **Law of Contract**

Essentials of a contract
Offer, acceptance and consideration
Capacity to Contract - Minor's agreement
Elements vitiating contract - mistake, fraud, misrepresentation, public policy, coercion, undue influence
Void Agreements
Mode of Discharge of a Contract - Specific performance, Frustration of contract, Novation of contract,
Breach of contract including anticipatory breach Contingent contract, Quasi Contract
Remedies for breach of contract - Damages Contract of Indemnity and Guarantee Contract of bailment, Pledge and agency

- **Law of Crimes**

Nature and Definition of Crime General Exceptions
Common Intention and Common Object Criminal Attempt, Conspiracy and Abetment Offences against Human Body
Offences against Property Defamation

- **Partnership & Sales of Goods**

Partnership Act-Nature and essentials of partnership, mutual rights and liabilities of partners, advantage of registration of firms
Sales of Goods Act
Limited liability partnership

- **Public International Law**

Nature of International Law and its relationship with Municipal Law Sources of International Law
Recognition of States and Governments United Nations
Settlement of International Disputes Human Rights

- **Environmental Law**

Environmental Pollution - Meaning of Environment and Environmental Pollution; Kinds of Pollution
Legislative Measures for Prevention and Control of Environmental Pollution in India – Air and Water Pollution and General Protection of Environment
International Development for protection of Environmental Pollution Remedies for Environmental Protection - Civil, Criminal and Constitutional Environmental impact assessment and control of Hazardous wastes

- **Law of Tort**

Meaning, Nature & Elements of Tort, Difference between, Tort & contract, Tort & Crime, Tort & Quasi Contract; *Ubi Jus Ubi Remedium, Injuria Sine Damno, Damnum Sine Injuria*
General Defences to an action of Tort Remoteness of Damage Vicarious Liability; Absolute and Strict Liability
Contributory Negligence; General Principles of Tortious Liability
Specific Torts - Negligence, Nuisance and Defamation Redressal of Consumer Grievances

- **Family Law (Hindu Law & Muslim Law)**

Sources of Family Law in India Marriage and Dissolution of Marriage Maintenance
Adoption and Guardianship Matrimonial Remedies Uniform Civil Code.

33. DEPARTMENT OF MATERIALS SCIENCE

The Centre of Materials Science offers a wide range of academic programs, including M.Sc. in Materials Science, M.Tech. in Materials Science and Technology, and Ph.D. in diverse interdisciplinary fields of science. Materials Science primarily focuses on developing advanced, environmentally friendly functional materials and enhancing existing materials to meet the demands of cutting-edge technology.

This field encompasses a variety of material categories, such as polymers, ceramics, glasses, metals, electronic materials, biomedical materials, composites, nano-materials, and various soft materials, including bio and liquid crystalline materials, essential for today's high-tech gadgets and even for the well-being of living organisms. Advances in biomaterials have significantly benefited human society.

While Materials Science is inherently interdisciplinary, involving chemistry for synthesis and processing, physics and applied physics for formulation and characterization, and engineering for device fabrication, it has evolved into a well-established, independent subject. The faculty members have successfully completed numerous research projects supported by organizations like DST, DIT, BRNS, and UGC, covering various aspects of materials research. Additionally, the Centre receives support through the prestigious DST-FIST program by the Government of India.

Moreover, the faculty members have established international collaborations with academic institutions in Ireland, Poland, Spain, the UK, France, South Korea, and the USA.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Applied subjects of material sciences.

🕮 SYLLABUS FOR CRET LEVEL-1 IN MATERIALS SCIENCE

- **Materials:**

Types and properties of metal and alloys, ceramics, composites, smart materials, shape memory alloys, biomaterials and liquid crystals, classification & nomenclature of polymers, polymerization mechanism, configuration and confirmations, Bulk and nano material preparation techniques, thin film deposition techniques

- **Quantum Mechanics:**

Schrodinger wave equation, Continuity equation Uncertainty principle, Eigen value. Confinement of the particle in a box, Potential step, Potential barrier, Tunnel effect, Periodic potential, Discussion on bound states, Degeneracy of states. Linear harmonic oscillator, Angular momentum operators, Commutation rules, Matrix representations, Addition of angular momenta.

- **Physics of Materials:**

Bonding and Lattice Dynamics, Free Electron Theory, Periodic Potential and Energy Band, Classifications into insulators, conductors, semiconductors, semimetals and superconductors

- **Structural and Spectroscopic Concepts:**

Symmetry, Crystal structures, point group, space group, orthogonality theorem, reducible and irreducible representations, character table, direct product, terms and level in chemical environment, symmetry of normal vibrations, internal coordinates, selection rules for fundamental vibrations (IR and Raman) transitions

- **Properties of Materials:**
  - **Dielectric:** Dielectric constant and polarizability, Dielectric in an ac field, Dielectric loss, Types and models of ferroelectric transition, Piezoelectric and pyroelectric materials
  - **Electronic:** Semiconductors, Direct and indirect gaps, Carrier statistics, Electrical conductivity and its temperature variation, III-V and II–VI compound semiconductors

- **Magnetic:** Hysterisis, Classification, Crystal field splitting, Exchange interaction, Hard and soft magnetic materials, Magnons, Langevin and Weiss theories
- **Optical:** Reflection, refraction, Absorption and transmission of electromagnetic radiation in solids, Optical absorption in insulators, semiconductors and metals
- **Thermal:** Laws of thermodynamics, Maxwell's relations and applications, Phase equilibrium, First order phase transition in single component systems, Clausius-Clayperon equation Statistical: Microcanonical, canonical and grand canonical ensembles, Maxwell, Boltzmann, Bose- Einstein and Fermi-Dirac statistics

- **Characterization techniques:**

Working principal, instrumentation and applications of XPS, SEM, AFM, AES, TEM, Raman, UV-visible, FTIR, TGA, DSC, DTA and various diffraction techniques

34. DEPARTMENT OF MATHEMATICS

The Department of Mathematics was established in 1872 and is situated in the Muir Central College Campus. The Department of Mathematics at the University of Allahabad is one of the oldest and most prominent departments of mathematics in Indian universities. The department offers undergraduate (three-year degree course) and postgraduate (four-semester CBCS) degrees and has a doctoral program leading to the PhD degree.

The department frequently organizes seminars, symposia, refresher courses, and conferences aimed at offering significant and landmark results of value and potential for future work to our students and faculty. This, in turn, raises the standard of teaching and education in the subject and prepares them to collaborate with various other centers of excellence in the country and abroad. The department emphasizes rigorous teaching and learning exercises throughout the year for all courses.

The department has a rich history and an eminent galaxy of scholars have adorned it. This includes legendary names such as A.C. Banerjee, P.L. Shrivastava, Padma Bhushan B.N. Prasad, Gorakh Prasad, H.C. Khare, R.S. Mishra, T. Pati, Pramila Srivastava, B.L. Sharma. The glorious tradition of the department is being continued. The present faculty members, with their team of students, are working in frontier areas of contemporary mathematics and its applications.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Measure Theory, Wavelet Analysis, Group Theory, Module theory, Differential Geometry, Fluid Mechanics, Magnetohydrodynamics, Dynamical Systems and Mathematical Modelling, Number Theory, Modular forms, Modelling on Thermoelasticity, Low Dimensional Topology (Knot Theory), Computational Finance.

🕮 SYLLABUS FOR CRET LEVEL-1 IN MATHEMATICS

- **Algebra:**

Basic theory of Groups, Permutation groups (Symmetric and Dihedral groups); Group actions, Class equation, Sylow Theorems and their applications; Euclidean domains, Principal ideal domains and Unique factorization domains; Fields, Finite fields, Galois theory.

- **Linear Algebra:**

Finite dimensional vector spaces; Linear transformations and their matrix representations, Systems of linear equations, Eigenvalues and Eigenvectors, Characteristic and Minimal polynomials, Diagonalization, Inner product spaces, Gram- Schmidt orthonormalization process, Modules over rings, Exact sequences, Hom Functor, Projective and Injective Modules.

- **Real Analysis:**

Limit, Continuity and Differentiability of functions of one and several real variables; Convergence of sequences and series of constants; Uniform convergence of sequence and series of functions, power series, Fourier Series; Riemann's theory of integration, Multiple integrals, line surface and volume integrals, Theorems of Green, Stokes and Gauss; Cardinality, Lebesgue measure, Measurable functions; Lebesgue integral, Fatou's lemma, Dominated convergence theorem.

- **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.

- **Topology:**

Basic concepts of topological spaces including metric spaces, product and quotient topology, Connectedness, Compactness, First and Second countability and separation axioms; Homotopy of maps, Fundamentals groups.

- **Differential Equations:**

Ordinary and Partial differential equations of first and second order, Solution techniques, Laplace Equations, Wave Equation, Diffusion Equations, Existence theory for Ordinary differential equations; System of Differential Equation, Power series methods: Legendre and Bessel functions and their properties.
Mathematical Methods: Fourier Series, Fourier Transforms, Sturm-Liouville Problems, Laplace transforms and their Applications, Calculus of variations and Linear Integral Equations.

- **Functional Analysis:**

Banach spaces, Hahn-Banach extension theorem, Open mapping and Closed graph theorems, Principle of Uniform Boundedness, Weak and Weak* topology; Hilbert spaces, orthonormal bases, Rieses Representation Theorem, Self-adjoint and Normal operators.

- **Mechanics:**

Euler's dynamical Equations, Lagrange's and Hamiltonian equations of Motion, Canonical transformations, Poission's brackets, Stresses and rates of strains components, Navier-Stokes Equations of viscous fluid motion and the equation of continuity, Kalvin Circulation Theorem, Uniform Line Sources, Doublets and Vortices, Milne-Thomson Circle Theorem, Blasius Theorem.

- **Differential Geometry:**

Elementary theory of curves and surfaces in Euclildian 3-space; Basic concepts in differentiable Manifolds, Tensors, Riemannian metrics, Riemannian manifolds, Levi Civita connection on a Riemannian manifold, Riemannian curvature tensor, Sectional, Ricci and Scalar curvatures, Einstein manifolds.

35. DEPARTMENT OF MEDIEVAL & MODERN HISTORY

The Department of Medieval & Modern History is one of the oldest departments in India and has made significant contributions to research. The Chair of Professor in the Department of Medieval & Modern History was established in 1912-13. Academic lectures and teaching began in December 1916. Over time, distinguished historians joined the department upon invitation and appointment by the first HOD, Prof. L.F. Rushbrook Williams. Notable scholars who joined between 1917 and 1919 include Ishwari Prasad, R.P. Tripathi, Beni Prasad, Sir Shafaat Ahmad Khan, and Dr. Tara Chand. Two of them, Beni Prasad and R.P. Tripathi, earned the D.Litt. Degree from the University of London while working under the legendary Harold Laski. By 1935, during the first session of the Indian History Congress in Pune, it was unanimously decided to elect Prof. Shafaat Ahmad Khan, then the HOD of our department, as its first president due to the immense contributions of historians working under his guidance. Their work gave rise to what later emerged as the "Allahabad School of History.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Medieval & Modern History

🕮 SYLLABUS FOR CRET LEVEL-1 IN MEDIEVAL & MODERN HISTORY

- **Medieval & Modern Indian History: Concepts, Ideas and Terms**

Khilafat	Pargana	Federalism
Sulah–i–kul	Communalism	Sarraf
Maharashtra–dharma	Bengal Vaishnavism	Utilitarianism
Turkan–i–Chahlghani	Orientalism	Polygars
Watan	Alt magha	Filtration Theory
Baluta	De–industrialization	Jagir
Iqta	Sbahna–i–Mandi	Forward Policy
Jizyah	Subsidiary Alliance	Dastur
Madad–i–maash	Mercantilism	Doctrine of Lapse
Amaram	Evangelicalism	Mansab (Rank)
Raya–Rekho	Economic Nationalism	Satyagraha
Jangama	Bhudan	Deshmukh
Chauth	Indian Renaissance	Swadeshi
Dyarchy	Panchsheel	Nadu
Hundi (Bills of Exchange)	Economic Drain	Revivalism
Colonialism	Mixed Economy	Indian Left
Paramountcy	Hindu Code	Bill

India from 1206 to 1526

Expansion and Consolidation – The Ghoris. The Turks, The Khiljis, The Tughlaqs, The Sayyids and the Lodis. Vijayanagar and Bahamani Kingdoms.

State and Religion–Concept of sovereignty, religious movements and Sufism.

Economic Aspect–Urban Centers, Industries, Trade and Commerce, Land Revenue and Prices. Mongol problem and its impact.

Administrative structure.

Art, Architecture and Literature.

Source – Archaeological, Persian, and non–Persian Literature, Foreign travelers' account.

- **India from 1526 onward**

Sources of Mughal period
Mughal Expansion and Consolidation – Babur's establishment of Mughal rule in India; Humayun and Surs; Akbar, Jahangir, Shahjahan and Aurangzeb.
Mughal relations with the nobility and the Rajputs.
Jahangir – the period of stability and expansion 1611–1621; the period of crises 1622–1627 – The Nurjahan Junta.
Decline of Mughal Empire: Political, administrative and economic causes.
The Maratha Movement the foundation of Swarajya by Shivaji – its expansion and administration, Maratha Confederacy and causes of decline.
Administration: Sher Shah's administrative reforms, Mughal administration, land revenue and other source of income, Mansabdari and Jagirdari.

- **Socio–economic and cultural life under the Mughals**

Village Society and Economy Art, Architecture and Literature Trade and Commerce.
Religious Policy from Akbar to Aurangzeb Urban Centers and Industries
Currency
Position of Women

- **Foundation of the British Rule**

Rise of European Power – Expansion and Consolidation of the British Rule.
British relations with major Indian powers – Bengal, Oudh, Hyderabad, Mysore, Marathas and Sikhs. Administration, under the East India Company and Crown, Paramountcy, Civil Service, Judiciary, Police and Army.
Local Self–Government, Constitutional Development from 1909 to 1935.

- **Economic and Social Policies**

Agrarian policy of the British, Land Revenue, Agriculture and Land Rights, Famine Policy, Rural Indebtedness.
Policy towards trade, and Industries, Condition of Labour, Trade Union Movements, Factory Legislation, Banking, Transport, Drain Theory.
Indian Society in transition, Christian missions, Socio–religious reform movements, status of women.
New Educational Policy, English Language, Modem Sciences, Journalism, Indian languages and Literature.

- **National Movement and Post–Independent India**

Rise of nationalism. Revolt of 1851. Tribal and Peasant Movements. Ideologies and Programmes of Indian National Congress. Swadeshi Movement. Indian Revolutionary Movement in India and abroad.
Gandhian Mass Movements. Ideologies and Programmes of the Justice Party; Left wing politics, Movement of the depressed classes, Genesis of Pakistan, India towards Independence and Partition. India after Independence, Rehabilitation after partition, Integration of Indian States, the Kashmir Question.
Making of the Indian Constitution, Structure of Bureaucracy and the police, Economic policies and the planning process, Linguistic reorganization of the States. Foreign policy initiatives.

- **World History: Concepts, Ideas and Terms**

Pre-History	Manorial System	Slavery
Humanism	Darwinism	Nation States
Burial Practices	Black Death	Aristocracy
Enlightened Despotism	Great Depression (1929)	Renaissance
Mother-Goddess	Feudalism	Confucianism
Divine Right	Feminism	Reformation
Law codes	Non–alignment	Slavery
Supremacy of Church	Parliamentary Democracy	Nation States
Athenian Democracy	Nazism	Aristocracy
Holy Roman Empire	Commonwealth	Renaissance
Imperial Rome	Imperialism	Confucianism
Social Contract and General will	Socialism	Reformation
Apartheid	Balance of power	Manorial System
Right of Man	Cold	War

Apartheid Post–modernism

- **Research in History**

Scope and Importance of History Objectivity and Bias in History Causation in History
History and its auxiliary science Significance of Regional History Recent trends of Indian History Research Methodology
Area of Proposed Research
Sources–Primary/Secondary in the Proposed area of Research. Recent Historical writings in the proposed area of Research.

36. DEPARTMENT OF MUSIC & PERFORMING ARTS

Established in 1926, the Department of Music at the University of Allahabad has evolved into a distinct entity specializing in Music Vocal/Sitar/Tabla and Musicology. Dr. Tara Chand and Dr. D.R. Bhattacharya played key roles during its inception. Initially offering diploma courses, Music became a B.A. optional subject in 1950, followed by postgraduate instruction in Vocal, Sitar, and Tabla. The curriculum includes junior and senior diploma courses, and the department has produced several D.Phil. graduates under the guidance of qualified faculty. Notably, the department has a rich history of musical conferences dating back to 1926 and experienced resurgence in the 1980s, hosting renowned artists. Throughout its existence, the Department of Music has enjoyed numerous prosperous years.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

The fields of performing arts.

🕮 SYLLABUS FOR CRET LEVEL-1 IN MUSIC & PERFORMING ARTS

- **Technical – Terminology**

Nada, Shruti, Swara, Grama–Moorchana, Jati, Raga, Tala Tan, Gamak, Gandharva–Gaan, Marga– Deshi, Giti, Gaan, Varna, Alankar, Melody, Harmony, Musical Scales, Musical intervals, Consonance–Dissonance Harmonics, Western and South Indian terminology and their explanation, Staff Notation, Drone, Alpatva–Bahutva Abirbhav–Tirobhav, Uthan, Peshkar, Kayda, Rela, Rang; Laggi, Ladi, Farshbandi, Tala, Laya, Matra, Avartan, Vibhag, Sashabda, Kriya, Nishadba, Kriya, Theka, Saral Gat, Adi Gat, Chakradar Gat, Farmaishi Gat and other variety of Gats and Kayadas, Upanga, Bhashanga, Gita, Kriti, Kirtana, Jatiswara, Pada, Swarjati, Ragmalika, Tillana, Nyasa, Amsa, Prasa, Yati, Anuprasa, Alapana, Neraval, Sangati and other terms, Gitinatya, Nritya–natya, Baitalik Varsha–Mangal, Vasantotsav, Gita–Bitana, Swara–Bitan Akarmatrik notation.

- **Applied Theory**

Detailed and critical study of Rags, Changing form of Ragas classification of Ragas, i.e. Grama Raga vargikaran, Mela Raga Vargikaran, Raga-Ragini Vargikaran. Thata Raga Vargikaran, and Raganga Vargikaran, time–theory of Ragas, Application of melody and harmony in Indian Music, Chords and its various kinds. Placement of shuddha and Vikrit Swaras on Shruties in ancient, medieval and modern period.
Detailed knowledge of prevalent talas of Hindustani music, knowledge of tala Dashpranas and Marga and Deshi talas of ancient period, comparative study of Hindustani and Karnatak tala system with special reference to ten pranas of tala, detailed study of different layakaris viz, Dugun, Tigun, Chaugun, Ada, Kuada, Viyada and method to apply them in compositions.
Tagore's treatment of Hindustani ragas and raginis, elements of Hindustani classical music Karnatak music, Western music from other provinces, folk music and Kirtan of Bengal and their influence of Tagore's treatment of raga.

- **Compositional forms and their Evolution**

Prabandha, Drupad, Khyal, Dhamar, Thumri, Tappa, Tarana, Chaturang, Trivat, Vrindagana, Vrinda Vadan, Javeli, Kriti, Tillana, Alap, Varnam (Pad Varnam and Tana Varnam), Padam Ragam, Tanam, Pallavi, Gita, Varna, Swarajati, Kalpita, Sangita, Ragamalika, Swara Kalpana (Manodharma Sangeet),
Main forms of Rabindra Sangeet History of Music of Bengal.

- **Gharanedar Gayakri**

Origin and development of Gharanas in Hindustani music and their contribution in preserving and promoting traditional Hindustani classical music. Merits and demerits of Gharana system. Origin and Development of Gharanas in Instrumental music and Percussion and their contribution in promoting traditional Indian Classical

music, merits and demerits of Gharana system. Study of traditions and specialties of different gharanas in vocal, instrumental and percussion group. Desirability and possibility of gharanas in contemporary music. Guru shishya parampara and different styles of singing and playing in Hindustani and Karnatak Music.
An overall survey of Rabindra Nath Tagore's musical creativity, tonal and rhythmic varieties of Tagore's musical compositions including his own experimental variations. Periods and phases of Tagore's musical compositions.
The Cultural atmosphere of Tagore's family (Pathuriaghata and Jorasanko, Calcutta). Thematic variations of Tagore's Music: (Puja, Swadesh, Prem, Prakriti, Vichitra, Anusthanik)

- **Contribution of Scholars to Indian Music and their textual tradition**

Narad, Bharat, Dattil, Matanga, Sharangadeva, Nanyadeva and others. Lochan, Ramamatya, Pundarik Vitthal, Somnath, Damodar Mishra, Ahobal, Hridaya Narain Deva, Vynkatmakhi, Sriniwas, Pt. Bhatkhande, Pt. V.D.P. Paluskar, Pt. Omkarnath Thakur, K.C.D. Brahaspati, and others.
Study of ancient, medieval and modern treatises in Percussion instruments like Bharat Natyashastra, Sangeet Samaysar, Radha Govind Sangit Sar, Madrul Mosiqui, Sangeet Shastra, Bhartiya Sangeet Mei Taal aur Roop. Abhinav Tala Manjari, and other treatises. Contribution of various Scholars to percussion instruments like Kudau Singh Bhagwan Das, Raja Chatrapati Singh, Anokhe Lal Ahmadjan Thirakwa, Shamta Prasad, Kishan Maharaj and others in ancient, medieval and modern period.
Tagore's Musical dramas (gitinatyas) and dance–dramas. (nrityanatyas); e.g., Valmiki Pratibha, Kalmrigaya, Mayur Khela, Chitranganda, Chanadlika, Shyama and other dramas full of various songs, i.e., dramas like Prayaschitta, Visarjan, Saradotsava, Raja, Phalguni, Taser Desh, Vasanta etc. Tagore's musical creativity in Gitabitan, Part I, II, III Swarabitan (notation books) Part I–63, Sangeet–China (Vishwa–Bharti).
Contribution of prominent Karnatak Scholars, composers and performers of medieval and modern period such as Ramamatya, Vyankatmakhi, Tyagraja, Muttu–Swami Dikshitara, Shyama Sastri, Gopal Krishna Bharat, Prof. Sambamoorti, Papanasam Shiv an, Vasantha Kumari, Subbulakshmi, Ramari, T.N. Krishnan and others.

- **Historical Perspective of Music**

A study of the historical development of Hindustani music (Vocal, Instrumental, Percussion), Karnatak Music and Rabindra Sangeet in ancient, medieval and modern period.
Contribution of Western Scholars to Indian Music.

- **Aesthetics**

Its origin, expression and appreciation: Principle of aesthetics and its relation to Indian Music, Rasa theory and its application to Indian Music.
Relationship of Musical aesthetics and Rasa to Hindustani Music (Vocal, Instrumental and Percussion), Karnatak Music and Rabindra Sangeet. Four aspects of Rasa Theory, Relation of Raga and Seasons, Bandish (composition) Kaku Bhed, Kala and its vargikaran.
Interrelationship of Fine arts with special reference to Rag–Ragini Paintings, Dhyan of Ragas and other, Bibliography of Rabindra Nath Tagore

- **Music Teaching and Research technologies**

Guru Shishya Parampara, Sangeet–Sampradaya Pradarsini and institutional system of music teaching with reference to Hindustani, Karnatak music and Rabindra Sangeet, Aims and objectives of Higher Education, Aspects of music Education.
Utility of teaching aids like electronic equipments in music education with reference to Hindustani, Karnatak music and Rabindra Sangeet.
The methodologies of music research, preparing synopsis, data collection, field work, writing project reports, finding bibliography, reference material etc. With reference to
Hindustani, Karnatak music and Rabindra Sangeet.
Study of interrelation between textual and oral tradition.
Contemporary Trends of Indian Music, Music Therapy, Distance Education of Music, Temple Music (Haveli Sangeet), Musicology and its vocational scope.

- **Folk Music**

Influence of folk music on Indian Classical Music, stylization of folk melodies into ragas, Popular folk tunes and folk dances of Hindustani, Karnatak and: Rabindra Sangeet, such as Baul, Bhatiyali, Lavani, Garba, Kajri, Chaity, Maand, Bhangra, Gidda, Jhoomar, Swang, Pandawani, Amar–Praner Manush, Acchhe Prane, Amar Sonar Bangla, Kirtan, Rai–Sera Jhumar, Karakattam, Kavadi Attam. Villuppattu, Maiyandi Melam and other

prominent folk forms.
Analysis of the elements of Hindustani folk music, Karnatak folk music or Indian folk music and Rabindra folk Sangeet or folk music of Bengal and the elements regarding their interrelationship.
General study of the folk music of various regions of India like Uttar Pradesh, Rajasthan, Haryana, Punjab, Maharashtra, Bengal and South India.

- **Instruments / Dance**

Origin, evolution, structure of various instruments and their well–known exponents of Hindustani (Vocal Instruments and Percussion), Karnatak Music and Rabindra Sangeet. Importance of Tanpura and its Harmonics.
Classification of Instruments of Hindustani, Karnatak Music in ancient, medieval and modern period. Popular instrument used in Rabindra Sangeet.
Elementary knowledge of Indian dances like kathak, Bharatnatyam, Kuchipudi, Oddissi, Kathakali etc.

37. DEPARTMENT OF VISUAL ARTS

The Department of Visual Arts was established in the year 1942 for the study of Painting. Its founder, Kala Guru K.N. Majumdar, had enriched the legacy of Bengal School of Painting. Each faculty member contributes to the variety of ideas and expertise in the subjects of Visual Arts. Visual Art courses encompass Painting, Sculpture, and Applied Arts, introducing concepts and materials related to Art, Art History, Aesthetics, Art Market, Fundamentals of Art, and Art Education. A wide range of materials, forms, and traditions, both representational and non-representational, are explored both practically and theoretically.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

The Department of Visual Arts is conducting research into various aspects of the subject through a systematic investigative process to discover fresh insights and significant findings. In Visual Arts research, scholars may examine the creative processes and artistic practices from ancient, medieval, modern, and contemporary periods. They also explore arts and artifacts from prehistoric and proto-historic centers, heritage, folk, tribal, traditional, and contemporary practices across different regions of the Indian subcontinent, with a particular focus on the eastern U.P. region. The primary goal is to uncover new documents and establish innovative theories to expand the scope of research in this field. Additionally, these artifacts may be assessed within the context of philosophical, psychological, socio-cultural, socio-economic, socio-political, or anthropological theories that are relevant to Visual Arts and aesthetics.

🕮 SYLLABUS FOR CRET LEVEL-1 IN PAINTING & VISUAL ARTS

- **Indian:**
  - **Pre-Historic Age:** Paleolithic, Mesolithic, Neolithic, Important Pre-historic Centres of India.
  - **Pre Buddha and Buddha Period –** Classical wall Painting: Ajanta, Bagh, Ellora, Sittanvasal, Ajanta.
  - **The Origin of Miniature Painting and their Main Schools:** Jain, Pala, Apabharansh, Mewar, Kishangarh, Bundi-Kota, Mugal & Pahari School, the Company School of Paintings and their Painters.
  - **The Renaissance School of Paintings and their Painters:** A. N. Tagore, Nand Lal Bose, K. N. Majumdar, Khastgir, A. K. Haldar etc. New Trends in Modern Indian Painting and their Painters: R.
  - N. Tagore, G. N. Tagore, Jamini Roy, Amrita Shergil, Raja Ravi Verma, Ram Kinkar etc.
  - **Art Movement of India:** Such as Progressive Art Group, Shilpi Chakra, Samikshavad etc.
  - **Creative Analyses** of Art and Artist such as Roerich, Souza, Raza, M. F. Hussain, Tayab Mehta, K.
  - S. Kulkarni, Ram Kumar, Manjeet Bava, Swaminathan, G. R. Santosh, Himmat Shah, Jeram Patel, Ramchandran, bhupen Khakkar, R. S. Bist, M. L. Nagar, A. S. Pawar, Satish Chandra, B. N. Arya, Ram Chandra Shukla etc.
  - **Aethetics -** Basic concept of Eastern & Western Aesthetics. Scope of Aesthetics, its relation to Science and Philosophy, Concept of Art and Beauty with special reference to thinkers such as Plato, Aristotle, Baumgarten, Kant, Hegel, Rogerfry, Clive Bell, Tolstoy, Oriental Aesthetics and its scope, basic principles of Indian Philosophy and Religious thought. Theories of Rasa and Rasanispati; Six Limbs of Indian Art, Interrelationship of various Aesthetic concept and three relevance to work of Art.
  - **Current Trends** – Art and Communication, Art and Tradition, Art and Expression, Art and Religion, Art and Symbolism; Art and Design, Art and Society, Comparative study of Painting,

Music and Poetry.
  - Impact of Industrialisation, Science and Technology on Art.
- **Western:**
  - The Primitive Cave Painting, Egyptian, Greek and Roman Painting
  - Early Christian and Byzantine Painting, Romanesque and Gothic Painting, Renaissance Painting
  - **Creative Analyses** of Art and Artist such as Michael Angelo, Ramphel, Leonardo-Da- Vinci, Titan and others.
  - **Creative Analyses** of Art and Artist such as (17th Century Painters) Rembrandt, Rubens, Vermeer, Velazquez and others.
  - **Creative Analyses** of Art and Artist of England and France; Mannerism, Baoque & Rococo Painting
  - **Referential** studies of main European Sculptures.
  - **Comparative Study** of various Stylistic Expressions and his capacity towards an innovative insight into the meaning of style in art history and culture; important movements in paintings and sculpture and sculpture from mid 19th Century to the present day.
  - Realism, Impressionism, Neo-impressionism and their Painters; Cubin, Expressionism, Surrealism and their Work and Painters, **Contemporary Art Movement** such as Action Painting-Synchronism; Orphism, Raynism, Constructivism, Abstract Expressionism etc.

38. DEPARTMENT OF ARBAIC AND PERSIAN *(PERSIAN)*

The Department of Arabic and Persian is dedicated to the study and research of two important languages and cultures: Arabic and Persian. These languages have rich literary, historical, and cultural traditions that span centuries, making them excellent subjects for academic inquiry. Our department aims to foster advanced scholarship and contribute to the broader understanding of these languages and their associated cultures.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Literature: Research in Arabic and Persian literature encompasses various periods and genres, from classical poetry to contemporary prose. Scholars explore the works of renowned authors, themes, and literary movements and trends within these languages.

Linguistics: Linguistic studies in Arabic and Persian include phonetics, syntax, semantics, and sociolinguistics. Researchers investigate language structure, language acquisition, and linguistic evolution within these languages.

Cultural Studies: This domain explores the cultural aspects of Arabic and Persian-speaking regions, including history, art, music, religion, and customs. Researchers delve into the cultural dynamics that have shaped these societies.

Translation Studies: Ph.D. candidates may focus on the translation of Arabic and Persian texts into other languages or vice versa. This field explores the challenges and strategies involved in translating between these languages.

Comparative Studies: Researchers may compare Arabic or Persian literature to other literatures like Hindi or Urdu.

🕮 SYLLABUS FOR CRET LEVEL-1 IN PERSIAN

Paper-II and Paper-III (Part A & B)

The syllabus is divided into the following six different parts. The first four headings consist of two units each, i.e., eight units and the remaing two headings from one unit each, i.e., the ninth and tenth unit:

The Ancient Iranian Literature
The Classical Persian Literature
The Indo-Persian Literature
The Modern Persian Literature
Literary History and Criticism
General information regarding the Persian speaking world

N.B. : All questions of Paper—III should be framed in Persian only.

Ancient Iranian Literature

General information regarding

اوستا

پارسی باستان

پهلوی اشکانی

پهلوی ساسانی

زبان وادبیات بین دوره ساسانی و دوره سامانی

Classical Persian Literature periods

سامانی

غزنوی

سلجوقی

Eminent poets and poetesses

رابعه قزداری

رودکی

فردوسی

عنصری

فرخی

عسجدی

منوچهری

مسعودسعدسلمان

خاقانی

انوری

باباطاهر

نظامی

Important Prose works

ترجمه تاریخ طبری

چهارمقاله

سیاستنامه

قابوسنامه

کلیله ودمنه

کیمیای سعادت وسفرنامه ناصرخسرو

Period

مغول(تیموری وتاتاری)

صفوی

قاجار

Eminent poets and poetesses

سنایی

عطار

ابوسعیدابی الخیر

ناصرخسرو

مولوی

سعدی

حافظ

جامی
خواجوی کرمانی
محتشم کاشی
قا آنی
انواع مختلف سخن سرایی

Important Prose works

انوار سهیلی
اخلاق جلالی
اخلاق ناصری
اخلاق محسنی
گلستان سعدی

Indo-Persian Literature

Periods

دورهٔ آغاززبانوادبیات فارسی درهند
دورهٔ مغول در هند

Eminent poets and poetesses

امیرخسرو
فیضی
غزالی مشهدی
قدسی

نظیری نیشاپوری
عرفی شیرازی
ابوطالب کلیم

Important Prose works

تذکرۃالاولیاٗ
راما ین
تاریخ کرشناجی
رت پدم
نل دمن
اکبرنامه
عیاردانش

دورہ تیموری و بعددرهند

Eminent poets and poetesses

غنی کشمیری
صائب تبریزی
زیب النساء
بیدل
غالب
اقبال

Famous Prose works

مجمع البحرین
سفینۃالاولیاء
چھارعنصر
آتشکدہ
خزانۂ عامرہ
سہ نثرظھوری
چھارچمن
دستنبو

Modern Persian Literature

General information regarding

آغازنثرجدید
روزنامہ نویسی درایران
فرق بین شعرکلاسیك وشعرجدید
ادبیات دورۂ مشروطیت

Eminent authors

دھخدا
زین العابدین مراغہ ای

جمالزاده
صادق هدایت
سعیدنفیسی
صنعتی زاده کرمانی
محمدحجازی
بزرگ علوی
صادق چوبك
غلامحسین ساعدی
محمد علی اسلامی

Famous poets and poetesses

قرةالعین
دهخدا
بهار
پروین اعتصامی
عارف قزوینی
ایرج میرزا
عشقی
سیمین بهبهانی
نیما یوشیج

General information regarding

انواع مختلف نثر جدید

شعرموج نو

سخنسرایی در دورهٔ انقلاب اسلامی

Famous authors

ایرج افشار

علی دشتی

محمدعلی افغانی

زرین کوب

جلال آل احمد

سیمین دانشور

نادرابراهیمی

Eminent poets and poetesses

فروغ فرخزاد

نادرنادرپور

شهریار

سهراب سپهریٔ

مهدی اخوان ثالث

احمدشاملو

سایه

پرویزناتل خانلری

Literary History and Criticism

شعرالعجم
تاریخ ادبیات در ایران
تاریخ زبان پارسی
سوادوبیاض
سبك شناسی
کاروان هند

The Literary History of Persia
History of Iranian Literature
Persian Literature at the Mughal Court
Post-Revolutionary Persian Verse

General information regarding Persian Speaking World, i.e., history, culture, literature, and society of

ایران
افغانستان
هندوستان
تاجیکستان
ازبکستان

39. DEPARTMENT OF PHILOSOPHY

Established in 1922, is not only one of the oldest philosophy departments in the country but also one of the largest, with over 3,000 students enrolled at the B.A., M.A., and Ph.D. levels. Over the past century, this department has made significant contributions to various areas of philosophy and has produced numerous distinguished alumni who have excelled in administration, academia, and politics.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Indian Philosophy, Western and Indian Epistemology, Analytic Philosophy, Philosophy of Religion, Contemporary Religious Problems, Religious Language, Applied/Practical Ethics, Contemporary Western Philosophy, Contemporary Indian Philosophy, Phenomenology & Existentialism, Philosophy of Mind.

🕮 SYLLABUS FOR CRET LEVEL-1 IN PHILOSOPHY

- **Classical Indian Philosophy:**

Vedic and Upanisadic world-views: Rta-the cosmic order, the divine and the human realms; the centrality of the institution of yajna(sacrifice), the concept of ma-duty/obligation; theories of creation
Atman- Self (and non-self), jagrat, svapna, susupti and turiya, Brahman, seryas and preyas Karma, samsara, moksa,
Carvaka: Pratyaksa as the only pramana, critique of the anumana and sabda. Rejection of the non-material entities and dharma and moksa.
Jainism: Concept of reality- sat, dravya, guna, paryaya, jiva, ajiva, anekantavada, syadvada and nayavada; theory of knowledg; bondage and liberation.
Buddhism: Four noble truths, astangamarga, nirvana, madhyam partipad, pratityasamutpada, ksanabhangavada, anatmavada
School of Buddhism: Vaibhasika, Sautrantika, Yagacara and madhyamika
Nyaya: Prama and aprama, pramanya and apramanya; pramana: pratyaksa, Nirvikalpaka, savikalpaka, laukika and alaukika; anumana: anavayavyatreka, lingaparamarsa, vyapti classification: vyaptigrahopayas. Hetvabhasa, upamana, sabda: Sakit, laksana, akanksa, yogyata, sannidhi and tatparya, concept of God, arguments for the existence of God, adrsta, nihsryeasa.
Vaisesika: Concept of padartha, dravya, guna, karma, samanya, samavaya, visesa, abhava causation: Asatkayavada, Samavayi, asamavayt, asamavayi nimittakarana, paramanvada, adrsta, nihsryeas.
Samkhya: Satkaryavda, prakrti and its evolutes, arguments for the existence of prakrit, nature of purusa, arguments for the existence and plurality of purusa, relationship between purusa and prakrit, kaivalya, atheism.
Yoga: patanjali's concept of citta and citta-vrtti, eight-fold path of yoga, the role of God in yoga. Purva-Mimamsa
Sruti and its importance, atheism of purvamimamsa, classification of srutivakyas, vidhi, nisedha and arthavada, dharma, bhavana, sabdanityavada, jatisaktivada.
Kumarila and prabhakara Schools of mimamsa and their major points of difference, triputi- samvit, jivatata, abhava and anupalabdhi, anvitabhidhanavada, abihitanvayavada.
Vedanta
Advaita- Rejection of difference: Adhyasa, maya, three grades of satta, jiva, jivanmukti, vivartavada.
Visistadvaita: Saguna Brahman, refutation of maya, aprthaksiddhi, parinamavada, jiva, bhakti and prapatti.
Dvaita- Rejection of nirguna brahman and maya, bheda and sakst, bhakti.

- **Modern Indian Thinkers:**

Vivekananda: Practical vedanta, universal religion. Aurbindo- Evolution, mind and supermind integral yoga.
Iqbal- Self, god, man and superman,

Tagore: religion of man, ideas on education.
K.C. Bhattacharyya: Concept of Philosophy, Subject as Freedom, the doctrine of maya Radhakrishnan-Intellect and intuition, the idealist view of life.
J Krishnamurti: Freedom from the known, analysis of self.
Gandhi: Non-violence, satyagraha, swaraj, critique of modern civilization. Ambedkar-Varna and the caste system, Neo-Buddhism.

- **Classical Western Philosophy**

Early greek philosophers, Plato and Aristotle.
Ionians, Pythagoras, parmenides, heraclitus and Democritus The Sophists and Socrates
Plato: theory of knowledge, knowledge (episteme) and opinion (daxa), theory of ideas, the method of dialectic, soul and God.
Aristotle: Classification of the sciences, the theoretical, the practical and the productive (theoria, praxis, techne), logic as an organon, critique of Plato's, Theory of ideas, theory of causation, form and matter, potentially and actuality, soul and God.
Medieval Philosophy St. Augustine- Problem of evil
St. Anselm: Ontolological Argument
St. Thomas Aquinas: Faith and reason, essence and existence, the existence of God.

- **Modern Western Philosophy**

Rationalism
Descartes: Conception of method and the need for method in philosophy, clarity and distinctness as the criterion of truth, doubt and methodological scepticism, the cogito-intuition or inference? innate ideas, the 'real' distinction between mind and matter, role of God, proofs for the existence of God. Mind-body interactionalism.
Spinoza: Substance, Attribute and Mode, the concept of 'God or nature'. The mind-body problem, pantheism, three order of knowing.
Libniz: Monadology, truths of reason and truths of fact, innateness of all ideas, proofs for the existence of God, principles of non-contradiction, sufficient reason and identity of indiscernibles, the doctrine of pre-established harmony, problem of freedom and philosophy.
Empiricistn
Locke: Ideas and their classification, refutation of innate ideas, theory of knowledge, three grades of knowledge, theory of substance, distinction between primary and secondary qualities.
Berkeley: Rejection of distinction between primary and secondary qualities, immaterialism, critique of abstract ideas, esse est percipi, the problem of solpsism, God and self,
Hume: Impressions and ideas, Knowledge concerning relation of ideas and knowledge concerning matters of fact, Induction and causality, the external world and the self, personal identity, rejection of metaphysics, scepticism, reason and the passions,
Critical philosophy and After
Kant: the crictical philosophy, classification of judgements, possibility of synthetic a priori judgement, the copernican revolution forms of sensibility, categories of understanding, the metaphysical and the transcendental deduction of the categories, phenomenon and noumenon, the ideas of Reason- soul, God and world as a whole, freedom and immortality, rejection of speculative metaphysics
Hegel: The conception of Geist (Spirit), the dialectical method, concept of being, non-being and becoming, absolute idealism.
Nietzsche: Critique of western culture, will to power,
Moore: Refutation of idealism, defence of commonsense, philosophy and analysis. Russell: Refutation of idealism, logic as the essence of philosophy, logical atomism.
Wittgenstein: Language and reality, facts and objects, names and propositions, the picture theory, philosophy and language, meaning and use, forms of life.
Husserl: The Husserlian method, Intentionality
Heidegger: Being and nothingness, man as being-in-the-world, critique of techonology civilization.
Logical Positivism: the veriflability theory of meaning, the verification principle, rejection of metaphysics, unity of science.
C.S. Pierce and William James: Pragmatic theories of meaning and truth.
G. Ryle: Systematically misleading expressions, category mistake, concept of mind, critique of Cartesian

dualism.
Vyavanharika and Paramarthika Satta Nitya and Anitya Dravya Karnata
Akasa, Dik and Kala Samanya and Sambandha Cit, Acit and Atman
Appearance and reality Being and becoming Casuality, Space and Time Matter, Mind and Self Substance and Universals
The Problem of personal identity Prama
Kind of Pramanas Khativada Pramanyavada
Anvitabhidhanavada and Abhihitanvayavada Sabdagraha
Difinitation of Knowledge Ways of Knowing Theories of error
Theories of truth Belief and scepticism Problems if induction
Concept of Pratyaksa in Nyaya Concept of Pratyaksa in Buddhism
Concept of Pratyaksa in Samkara Vedanta Nature and kind of Anumana
Definition and Nature of Vyapti Hetvabhasas
Rna and Rta Purusarthas, Svadharma
Varnadharma and Asramadharma Niskamakarma and Lokasamgraha Pancastla and Triratnas Brahmavtharas
Good right, justice Duty and obligation Cardinal virtues Eudaemonism
Freedom and responsibility Crime and punishment
Ethical cognitivism and non-cognitivism Ethical realism and intuitionism
Kant's moral theory Kinds of utilitarianism
Human rights and social disparities Feminism
Truth and validity Nature of Propositions Categorical syllogism Laws of thought
Classification of propositions Square of opposition
Truth-function and propositional logic Quantification and rules of quantification Decision procedures Proving validity
Argument and Argument-form Axiomatic system, consistency, completeness

40. DEPARTMENT OF PHYSICAL EDUCATION

The Department of Physical Education at our institution has been a vital part of the educational process since its establishment in 1987. It prioritizes holistic well-being, focusing on the body, mind, and soul. In line with the Sanskrit adage *"शरीरमाद्यम खलु धर्म साधनम,"* it believes that physical education is integral to a complete education for individuals of all ages and genders. The department aims to instill health consciousness, fostering physical, mental, and social development. As our nation progresses, the need for a robust foundation in physical education, sports, yoga, and recreation becomes imperative to nurture human resources that contribute to the nation's growth and prosperity. We are committed to preparing quality physical education teachers and promoting excellence in this field, contributing to the overall well-being and life skills of the younger generation. Since its inception, the department has evolved and expanded, with ongoing curriculum enhancements and new programs in development. We are dedicated to the professional welfare of our students, providing various programs and outreach activities, including test and measurement, fitness lectures, counseling for competitive exams, and intra-mural programs. Our goal is to create a thriving center of excellence in physical education, yoga, and sports at our university, inspiring individuals to lead healthy and fulfilling lives.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Physical Education, Sports Psychology, Exercise Physiology under the broader area of Physical Education.

🕮 SYLLABUS FOR CRET LEVEL-1 IN PHYSICAL EDUCATION

- Introduction to Physical Education and definition, aim and objectives of Physical Education and other terms- health education and recreation.
- Philosophies of Education as applied to Physical Education- Idealism, Naturalism, Realism, Pragmatism, Existentialism, and Humanism.
- Biological basis of physical activity- benefits of exercise, growth and exercise, exercise and well-being sex and age characteristic of adolescent body types.
- Psychological basis of Physical Education-Play and Play theories, general principles of growth and development, Principles of motor- skill acquisition, transfer of training effects.
- Sociological basis of Physical Education- socialization process, social nature of men and physical activity, sports as cultural heritage of mankind, customs traditions and sports, competition and cooperation.
- Physical Education in ancient Greece, Rome and Contemporary Germany, Sweden, Denmark and Russia.
- Olympic movement- Historical development of ancient and modern Olympic Games. Physical Education in India.
- Physiology of Muscular activity, neurotransmission and movement mechanism, Physiology of respiration.
- Physiology of blood circulation.
- Factors influencing performance in sports.
- Bioenergetics and recovery process.
- Athletic injuries-their management and rehabilitation. Therapeutic modalities.
- Ergogenic aids and doping.
- Joints and their movements-planes and axes. Kinetics, Kinamatics-linear and angular, levers.
- Laws of motion, principles of equilibrium and force, spin and elasticity. Posture, Postural deformities

and their correction.

- Mechanical analysis of various sports activities.
- Mechanical analysis of fundamental movements- (running, jumping, throwing, pullingand pushing). Massage manipulation and therapeutic exercises.
- Learning process – theories and laws of learning.
- Motivation, theories and dynamics of motivation in sports.
- Psychological factors affecting sports performance- viz., stress, anxiety, tension and aggression. Personality, its dimensions, theories, personality and performance.
- Group dynamics, team cohesion and leadership in sports. Sociometrics, economics and politics in sports.
- Media and sports.
- Development of teacher education in Physical Education. Professional courses in sports and Physical Education in India. Professional Ethics.
- Qualities and Qualifications of Physical Educational Personnel. Principles of curriculum planning.
- Course content for academic and professional courses. Age charaecterstic of pupils and selection of activities.
- Construction of class and school Physical education Time Table.
- Health-Guiding principles of health and health education. Nutrition and dietary manipulations.
- Health-related fitness, obesity and its management. Environmental and occupational hazards and first aid. Communicable diseases-their preventive and therapeutic aspect. School health programme and personal hygiene.
- Theories and principle of recreation.
- Recreation programme for various categories of people.
- Characteristic and principle of sports training. Training load and periodization.
- Training methods and specific training programme for development of various motor qualities. Technical and Tactical preparation of sports.
- Short-term and long-term training plans.
- Sports talent identification-process and procedures.
- Preparing for competition-(build up competition, main competition frequency, psychological preparation).
- Rules of Games and Sports and their interpretations.
- Nature, scope and type of research. Formulation and selection of research problem.
- Sampling- process and techniques. Methods of research.
- Data collection- tools and techniques.
- Statistical techniques of data analysis-measures of central tendency and variability, Correlation, normal probability curve, *t*-test and *f*-test, chi-square, *z*-test.
- Hypothesis-formulation, type and testing. Writing research report.
- Concept of test, measurement and evaluation. Principle of measurement and evaluation.
- Construction and classification of tests. Criteria of test evaluation.
- Concept and assessment of physical fitness, motor fitness, motor ability and motor educability. Skill test for Badminton, Basket ball, Hockey, Lawn-tennis, Soccer, Volley ball.
- Testing psychological variables- competitive anxiety, aggression, team cohesion, motivation, self-concept.
- Anthropometric measurement and body composition.
- Concept and principle of management. Organisation and function of sports bodies. Intramurals and extramurals.
- Management of infrastructure, equipments, finance and personnel. Methods and techniques of teaching.
- Principles of planning Physical Education lessons. Pupil-teacher interaction and relationship.
- Concepts of techniques of supervision.

41. DEPARTMENT OF PHYSICS

The Department of Physics at the University of Allahabad has a rich history of academic and research excellence. Established in 1922, it began with pioneering work in Spectroscopic Analysis of Atomic Spectra, Ionospheric Studies, Acoustic & Ultrasonic Measurements, and X-ray Spectroscopy. Nobel laureates, including Compton, Eddington, Raman, and Summerfield, visited the department. Distinguished leaders like Prof. Saha and Prof. Krishnan significantly contributed to its growth. Over the years, the department expanded its research areas, including X-ray studies, microwave studies, quantum optics, non-linear optics, and more. Today, it boasts modern research facilities in emerging fields like laser-based spectroscopy, nanomaterial synthesis, and solar cell technology.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Fields of Physics and Applied Physics.

🕮 SYLLABUS FOR CRET LEVEL-1 IN PHYSICS

- **Basic Mathematical methods:**

Calculus: Vector algebra and vector calculus. Linear algebra, matrices. Linear differential equations. Fourier series, Elementary complex analysis.

- **Classical Dynamics:**

Basic principles of classical dynamics. Lagrangian and Hamiltonian formalism. Symmetries and conservations laws. Motion in the central field of force. Collisions and scattering Mechanics of a system of particles. Small oscillations and normal modes. Wave motion – wave equation, phase velocity, group velocity, dispersion. Special theory of relativity – Lorentz transformations, addition of velocities, mass–energy equivalence.

- **Electromagnetic:**

Electromagnetics – Laplace and Poisson equations, boundary value problems. Magnetostatics – Ampere's theorem, Biot–Savart law, electromagnetic induction. Maxwell's equations in tree space and in linear isotropic media. Boundary conditions on the fields at interface. Scalar and vector potentials. Gauge invariance. Electromagnetic waves – reflection and refraction, dispersion, interference, coherence, diffraction, polarization. Electrodynamics of a charged particle in electric and magnetic fields. Radiation from moving charges radiation from a dipole. Retarded potential.

- **Quantum Physics and Applications:**

Wave–particle duality. Heisenberg's uncertainty Principle. The Schrodinger equation Particle in a box, Harmonic Oscillator, Tunelling through a barrier. Motion in a central potential, Orbital angular momentum. Angular momentum algebra, spin. Addition of angular moments. Time–independent perturbation theory. Fermi's Golden Rule. Elementary theory of scattering in a central potential. Phase shifts, partial wave analysis. Born approximation. Identical particles, spin statistics connection.

- **Thermodynamic and Statistical Physics:**

Laws of thermodynamics and their consequences, Thermodynamics potentials and Maxwell's relations. Chemical potential, phase equilibria. Phase space, microstates and macrostates. Partition function. Free Energy and connection with thermodynamics quantities. Classical and quantum statistics. Degenerate electron gas. Blackbody radiation and Planck's distribution law, Bose– Einstein condensation. Einstein and Debye models for lattice specific heat.

- **Experimental Design:**

Measurement of fundamental constant: e, h, c. Measurement of High & Low Resistance, L and C.

Detection of X–rays, Gamma rays, charged particles, neutrons etc: Ionization chamber, proportional counter, GM counter, Seintillation detectors. Solid State detectors. Emission and Absorption Spectroscopy. Measurement of Magnetic field, Hall effect, magnetoresistence. X–ray and neutron Diffraction. Vacuum Techniques: basic idea of conductance, pumping speed etc. Pumps: Mechanical Pump, Diffusion pump, Gauges; Thermocouple, Penning, Pirani, Hot cathode. Low Temperature: Cooling a sample over a range upto 4 K and measurement of temperature. Measurement of Energy and Time using electronic signals from the detectors and associated instrumentation. Signal processing, A/D conversion & multichannel analyzers. Time–of–fight technique; Coincidence Measurement: true to chance ratio, correlation studies. Error Analysis and Hypothesis testing; Propagation of errors, Plotting of Graph, Distribution, Least squares fitting, criteria for goodness of fits – chi square test.

- **Electronics:**

Physics of p–n junction. Diode as a circuit element; clipping, clamping: Rectification, Zener regulated power supply: Transistor as a circuit element: CC, CB and CE configuration. Transistor as a switch, OR, AND, NOT gates. Feed back in Amplifiers. Operational amplifier and its applications: inverting, non–inverting amplifier, adder, integrator, differentiator, wave form generator, comparator & Schmidt trigger. Digital integrated circuits – NAND & NOR gates as building blocks, X–OR Gate, simple combinational circuits, Half & Full adder, Flip–flop, shift register, counters Basic principles of A/D & D/A converters: Simple applications of A/D & D/A converters.

- **Atomic & Molecular Physics:**

Quantum states of an electron in an atom. Hydrogen atom spectrum Electron spin. Stern– Gerlach experiment Spin–orbit coupling, fine structure, relativistic correction, spectroscopic terms and selection rules, hyperfine structure. Exchange symmetry of wave functions. Pauli's exclusion principle, periodic table alkali – type spectra, LS and JJ coupling. Zeeman, Paschen–Back and Stark effects. X–Rays and Auger transitions, Compton effect Principles of ESR, NMR; Molecular Physics: Covalent ionic and Van der Wall's interaction. Rotation/Vibration spectra. Raman Spectra, selection rules, nuclear spin and intensity alternation, isotope effects, electronic states of diatomic molecules, Frank–Condon principle. Lasers–spontaneous and simulated emission, optical pumping, population inversion, coherence (temporal and spatial) simple description of Ammonia maser, CO_2 and He–Ne Lasers.

- **Condensed Matter Physics:**

Crystal classes and systems, 2D & 3D lattices. Bonding of common crystal structures, reciprocal lattice, diffraction and structure factor, elementary idea about point defects and dislocations. Lattice vibrations, Phonons, specific heat of solids, free electron theory– Fermi statistics; heat capacity. Electron motion in periodic potential, energy bands in metals, insulators and semi–conductors; tight binding approximation, impurity levels in doped semi– conductors. Electronic transport from classical kinetic theory, electrical and thermal conductivity. Hall effect and thermo– electric power transport in semi–conductors. Di–electrics–Polarization mechanisms, Clausius–Mossotti equation, Piezo, Pyro and ferro electricity, Dia and Para magnetism; exchange interactions, magnetic order, ferro, antiferro and ferrimagnetism. Super conductivity–basic phenomenology; Meissner effect, Type–1 & Type–2 Super conductors, BCS Pairing mechanism.

- **Nuclear and Particle Physics:**

Basic nuclear properties – size, shape, charge distribution, spin & parity, binding, empirical mass formula, liquid drop model.

Nature of nuclear force, elements of two–body problem, charge independence and charge symmetry of nuclear forces. Evidence for nuclear shell structure. Single particle shell model its validity and limitation, collective model. Interactions of charged particles and e.m. rays with matter. Basic principles of particle detectors – ionizations of chamber, gas proportional counter and GM counter, scintillation and semiconductor detectors. Radioactive decays, basic theoretical understanding. Nuclear reactions, elementary ideas of reaction mechanisms, compound, nucleus and direct reactions, elementary ideas of fission and fusion. Particle Physics: Symmetrics and conservation laws, classification of fundamental forces and elementary particle, iso–spin, strangeness, Gell–Mann Nishijima formula. Quark model C.P.T. invariance in different interactions, parity–nonconservation in weak interaction.

42. DEPARTMENT OF POLITICAL SCIENCE

The Department of Political Science at this University started in 1927 and has a rich history. It was led by distinguished historians like Dr. Beni Prasad, Prof. Ishwari Prasad, and Dr. Tara Chand, along with renowned political scientists such as Prof. A.B. Lai and Prof. A.D. Pant. The department became known for its academic excellence and the remarkable achievements of its students, particularly in Civil Service Examinations. Many prominent bureaucrats who played significant roles at national and state levels were once students of this department. Moreover, the department has produced a large number of JRF and NET scholars, clearly demonstrating its commitment to high-quality teaching and research. In fact, it has earned recognition as a leading center of knowledge and research in North India.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

The department is emphasizing research-oriented teaching and offers optional papers at the M.A. level to adapt to evolving subject dimensions. Some of the available papers include Green Political Thought, South Asian Political System, Political Sociology, Human Rights, State Politics in India (with a focus on U.P.), Feminist Theory, Politics, Culture and Mass Media, International Law, and Research Methodology. Recognizing the growing significance of International Relations and Security Studies, the department encourages students to explore research in these areas, including South Asian Regional Security, Foreign Policy of Major Powers, and India in World Affairs.

🕮 SYLLABUS FOR CRET LEVEL-1 IN POLITICAL SCIENCE

- **Political Theory and Thought**

Ancient Indian Political Thought: Kautilya and Shanti Parva. Greek Political Thought: Plato and Aristotle.
European Thought – I: Machiavelli, Hobbes, Locke, Rousseau. European Thought – II: Bentham, J.S Mill, Hegel, Marx and Green. Contemporary Political Thought – I: Lenin, Mao, Gramsci.
Contemporary Political Thought – II: Rawls, Nozic and Communitarians.
Modern Indian Thought: Gandhi, M.N. Roy, Aurobindo Ghosh, Joy Prakash Ambedkar, Savarkar.
Concepts and Issue – I: Medieval Political Thought: Church State Relationship and Theory of Two Swords.
Concepts of Issue – II: Behaviouralism and Post–Behaviouralism, Decline and Resurgence of Political Theory.
Democracy, Liberty and Equality.

- **Comparative Politics and Political Analysis**

Evolution of Comparative Politics as a discipline; nature and scope.
Approaches to the study of comparative politics: Traditional, Structural – Functional, Systems and Marxist.
Constitutionalism: Concepts, Problems and Limitations.
Forms of Government: Unitary – Federal, Parliamentary – Presidential.
Organs of Government: Executive, Legislature, Judiciary – their interrelationship in comparative perspective.
Party Systems and Pressure Groups; Electoral Systems. Bureaucracy – types and roles.
Political Development and Political Modernization.
Political Culture, Political Socialization and Political Communication. Political Elite; Elitist theory of Democracy.
Power, Authority and Legitimacy. Revolution: Theories and Types.
Dependency: Development and Under Development.

- **Indian Government and Politics**

National Movement, Constitutional Developments and the Making of Indian Constitution. Ideological Bases of the Indian Constitution, Preamble, Fundamental Rights and Duties and Directive Principles.
Constitution as Instrument of Socio–Economic Change, Constitutional Amendments and Review.

Structure and Process – I: President, Prime Minister, Council of Ministers, Working of the Parliamentary System.
Structure and Process – II: Governor, Chief Minister, Council of Ministers, State Legislature. Panchayati Raj Institutions: Rural and Urban, their working.
Federalism: Theory and Practice in India; Demands of Autonomy and Separatist Movements; Emerging trends in Centre–State Relations.
Judiciary: Supreme Court, High Court, Judicial Review, Judicial Activism including Public Interest Litigation cases, Judicial Reforms.
Political Parties, Pressure Groups, Public Opinion, Media; Subaltern and Peasant Movements. Elections, Electoral Behaviour, Election Commission and Electoral Reforms.

- **Public Administration**

Development of Public Administration as a discipline; Approaches to the study of Public Administration: Decision–making, Ecological and Systems; Development Administration.
Theories of Organization.
Principles of organization: Line and staff, unity of command, hierarchy, span of control, centralization and decentralization, Types of organization – formal and informal; Forms of organization; department, public corporation and board.
Chief Executive: Types, functions and roles.
Personnel administration: Recruitment, Training, Promotion, Discipline, Morale; Employee– Employer Relations.
Bureaucracy: Theories, Types and Roles; Max Weber and his critics. Civil servant – Minister relationship.
Leadership, its role in decision–making; Communication.
Financial Administration: Budget, Audit, Control over Finance with special reference to India and UK.
Good Governance; Problems of Administrative Corruption; Transparency and Accountability; Right to Information.
Grievance Redressal Institutions: Ombudsman, Lokpal and Lokayukta.

- **International Relations**

Contending Theories and Approaches to the study of International Relations; Idealist, Realist, Systems, Game, Communication and Decision–making.
Power, Interest and Ideology in International Relations; Elements of Power: Acquisition, use and limitation of power, Perception, Formulation and Promotion of National Interest, Meaning, Role and Relevance of Ideology in International Relations.
Arms and Wars: Nature, causes and types of wars/conflicts including ethnic disputes; conventional, Nuclear/bio–chemical wars; deterrence, Arms race, Arms control and Disarmament.
Peaceful settlement of disputes, conflict resolution, Diplomacy, World–order and Peace studies.
Cold war, Alliance, Non–Alignment, End of Cold war, Globalization.
Rights and Duties of States in international law, intervention, Treaty law, prevention and abolition of war.
Political Economy of International Relations: New International Economic Order, North– South Dialogue, South–South Cooperation, WTO, Neo–colonialism and Dependency.
Regional and sub–regional organizations especially SAARC, ASEAN, OPEC, OAS.
United Nations: Aims, Objectives, Structure and Evaluation of the working of UN; Peace and Development perspectives; Charter Revision; Power–struggle and Diplomacy within UN, Financing and Peace–keeping operations.
India's Role in international affairs: India's relations with its neighbours, wars, security concerns and pacts, Mediatory Role, distinguishing features of Indian Foreign Policy and Diplomacy.

43. DEPARTMENT OF PSYCHOLOGY

Established in 1961, the Department of Psychology at this university has made remarkable strides in the field. Founded with just one faculty member, Prof. Durganand Sinha, it has since evolved into a distinguished institution. The department's growth saw the addition of renowned scholars and substantial UGC support. Notably, it became a Center of Advanced Studies in 1984, a testament to its significant contributions to Indian psychology. Over the years, it introduced innovative programs, conducted workshops, and forged international partnerships, cementing its position as a leading hub for psychological research and education.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

The domains of Psychology.

🕮 SYLLABUS FOR CRET LEVEL-1 IN PSYCHOLOGY

SECTION-I (COMPULSORY)

- **Advances in Cognitive Psychology:**
  - Introducing Cognitive Psychology: Meaning of cognition; Approaches to Cognitive Psychology: Information processing and connectionist.
  - Attention and Perception: Selective attention; Theories of selective attention; A brief idea about divided attention; Organization of visual perception; Top-down and Bottom-up theories of perception.
  - Memory Processes: Features of sensory memory; Characteristics and components of short-term memory; A brief idea about working memory; Encoding, storage and retrieval in long-term memory; Autobiographical and eyewitness memory; Episodic and semantic memory distinction; Theories of forgetting: Decay, Interference and cue dependent forgetting.
- **Motivation and Emotions:**
  - Concept and characteristics of motivation; Theories of motivation: Instinct, Need, Drive, Incentive, Need hierarchy; Hunger motivation: Short-term physiological model, long-term physiological model and comprehensive model of hunger; Achievement motivation: Atkinson model, Dynamics of action model, Contemporary approaches to achievement motivation.
  - Nature and components of emotions; Relationship between motivation and emotion; Biological aspects of emotion: James-Lange, Contemporary perspective, Differential- emotion theory, Facial-feedback hypothesis, Cognitive aspects of emotion: Appraisal, Complex appraisal and appraisal process.
- **Quantitative Analysis in Psychological Research:**
  - Characteristics of scientific approach, Research hypothesis, Conceptual and operational definition, Measurement levels, Reliability and Validity.
  - An overview of statistical analysis: Central tendency, Variability, Correlation, Normal probability curve, Types of error in hypothesis testing, Types of t-test, Analysis of variance: One-way and two-way; Newman Keuls test, Regression analysis: Simple regression and multiple regression; An overview of SPSS analysis.
- **Advanced Research Methods:**
  - Methods in behavioural research; Variables: Controls and manipulation, Ethical Problems in experimental research, Sampling techniques, Steps in test construction.
  - Research Designs: Randomized group, Randomized block, Repeated measure, Pre-Post, Factorial Designs, Single Subject design, Quasi Experiments.
  - Theoretical bases of qualitative research; Methods of qualitative research: Narrative analysis, Focus group discussion and Content analysis.

- **Physiological Foundations of Psychological Processes:**
  - Methods of physiological psychology; Structure and functions of neurons and supporting cells; Action potential; Structure of synapses; Postsynaptic potentials.
  - Structure and functions of frontal, parietal, temporal and occipital lobes; Thalamus, Hypothalamus, Cerebellum, Spinal cord and Autonomic Nervous System; Synaptic plasticity, Long-term potentiation, anterograde amnesia and role of the amygdala; Diathesis-stress model; Dopamine hypothesis; Brain abnormalities in Schizophrenia; monoamine hypothesis.
- **Advancesin Social Psychology**
  - Social Psychology: Historical background; Asch's impression formation research to Anderson's cognitive algebra to modern schema approach; Schema and prototypes, Types of schema, Schema development and change: Social cognitive processes and person perception: Encoding, storage and retrieval of social information; Social inference; Errors in inference.
  - Attitudes: Attitudes and behaviour, Reasoned action theory; Attitude change: Major theories; Resisting change: Reactance and Inoculation.
  - Interaction in group: Individual vs group performance, Group decision making, Groupthink, Group polarization effect; Conformity and minority influence: Social impact theory, Discrimination and Social Stigma.
- **Classical Theories and Modern Perspectives in Personality:**
  - Nature of personality and methods of Study: Observational, Correlational and Experimental.
  - Psychoanalytic aspects of personality: Freud, Jung, Adler, Horney and Erikson.
  - Behavioural and cognitive theories of personality: Skinner, Bandura, Kelly, Lewin; Trait theories of personality; Cattell, Allport, Eysenk, Big-five factors, Humanistic aspects of personality: Maslow and Rogers.
- **Developmental Psychology**
  - Life-span development; Theories of development: Freud, Erickson, Werner, Piaget, Vygotsky's social-historical development, Kohlberg's theory of moral reasoning, Turiel's constructivist theory, Shweder's social communication theory, Ainsworth's attachment, Wilson's socio-biology.
  - Concepts of Socialization: Enculturation and acculturation: socialization in Indian context, Parenting styles.

SECTION-II (OPTIONAL) Any ONE Group from Group-A / Group-B / Group–C

GROUP-A

- **Organizational Behaviour:**
  - Nature and definition of organization and organizational behaviour; Approaches to organizational behaviour: Scientific management, Classical organizational theories, Human relations movement, system and open system approaches, Contingency perspective, Interactional perspective.
  - Theories of motivation: Hierarchy of Needs Theory, ERG Theory, Two Factor Theory, Theory X and Theory Y, Equity Theory; Motivating performance at work settings. Power and politics in Organization
  - Group dynamics: Groups and teams, Classical and contemporary approaches to leadership: trait approach, behavioural approach and situational/contingency approach, Fiedler's and Hersey & Blanchard's Theories. Charismatic leadership and transformational leadership.
  - Decision making in Organization: Individual decision making and Group decision making.
  - Organizational culture: nature and Ouchi framework; Organizational Socialisation: Work and organizational socialization, Schein and Van Maanen theory.
- **Human Resource Management:**
  - Nature and definition of Human Resource Management, Evolution of management of human resources, Functions of HR managers.
  - Need for manpower planning: Current and Future; Techniques for determining human resource requirements.
  - Recruitment and selection: Job analysis, Recruitment and selection processes, Selection methods: Application, tests, interviews, job review.
  - Remuneration and reward: Compensation administration, Factors determining pay, Rewarding productive employees vs. rewarding teams.

- Performance appraisal: Nature and significance of performance appraisal, Issues in performance appraisal, Methods of performance appraisal.

OR

GROUP-B

- **Health Psychology**
  - Definition of health, Current perspectives on health and illness, Conducting Research, The Body's Physical System: The Endocrine System, The Cardiovascular System, The Immune System.
  - Health behaviours, Lay theories of health, Health belief models, meaning of being healthy and ill, Illness cognitions, Leventhal's Self-regulatory Model.
  - Health and Behaviour, General Factors in Health-Related behaviours, Developmental, Gender and Socio-cultural Factors in Health. Substance Use and Abuse, Alcohol Use and Abuse, Obesity and Eating Behaviour.
  - The Management of Pain and Discomfort, Perceiving and Interpreting Symptoms; Patients-Practitioner Relationship; Compliance; Adhering to Medical Advice.
  - Adjustment to Chronic disease: Cancer, HIV, Diabetes Mellitus, Coronary Heart Diseases, Psychological Interventions for people with Chronic Conditions.
- **Stress and Coping**
  - What is Stress, Concept of Stress in the Indian and Western tradition, Myths and Facts about Stress, Physiology of Stress, Measuring Stress: Physiological Arousal, Life Events and Daily Hassles, Models of Stress: General Adaptation Syndrome Model, Cannon's Flight or fight Model, Stimulus Overload/Underload Model, Optimal Information Flow Model, Cognitive Model of Stress, Person-Environment (P-E) Fit Model and Systems Model of Stress.
  - Sources of Stress: Job, Family and Society, Consequences of Stress: Medical, Behavioural, Emotional, and Cognitive.
  - Modifiers of Stress: Social Support, Sense of Personal Control and Personality.
  - Burnout: Concept and its impact on Health.
  - Definition of coping, Methods of Coping: Problem focused Coping, Emotion focused Coping, Engagement Coping, Disengagement Coping, Accommodative Coping, Meaning focused Coping, and Proactive Coping, Strategies for Coping: Emotional discharge, Cognitive Redefinition, Denial, Intellectualization, Avoidance and Time Management
  - What is Stress Management, Techniques of Stress Management: Medication, Relaxation, Systematic Desensitization, Biofeedback, Modelling, Meditation, Hypnosis, Buffer Creation, and Social Support Interventions.

OR

GROUP – C

Clinical Psychology

- Field of Clinical Psychology: History of Clinical Psychology in India, Present Status and Professional Issues.
- Theories and Models of Psychopathology**:** Psychodynamic Theories (Freud and Adler), Behavioural Theories (Wolpe, Skinner and Bandura), Phenomenological Perspectives (Rogers, Frankl and Binswanger); Cognitive Theories (Beck and Ellis), Systems Model and MMPI Model.
- Clinical Assessment Procedures: Signs and Symptoms of Mental Disorders, Classification schemes: DSM-5, ICD-11; Clinical methods: Case Study, Mental Status Examination, Interview.
- An overview of Clinical Child Psychology and Clinical Neuropsychology.

Clinical Interventions:

- Defining Psychotherapy: Course of Clinical Interventions: Initial, Middle and Termination stages of Psychotherapy.
- Interventions with Individuals: Psychoanalysis, Adlerian psychotherapy, Person-centered therapy.
- Cognitive-Behavioural Interventions: Wolpian, operant and modelling procedures, Rational Emotive Behaviour Therapy and Cognitive Therapy.

- Group Interventions: Mechanisms of group psychotherapy and group processes; Interventions with families.
- Community and cultural interventions: Primary, Secondary and Tertiary prevention, Crisis intervention, Indian notions of psychotherapy.

44. DEPARTMENT OF ENGLISH AND MODERN EUROPEAN LANGUAGES *(RUSSIAN)*

The Department of English and Modern European languages, University of Allahabad, has a unique distinction of being one of the oldest English Departments in the country. Established in 1922, it was part of the British plan of westernizing the natives of the land through education, "the white man's burden". As part of that colonial legacy, we still have the S.G Dunn (our first British Head of the Department) memorial gold medal for the undergraduate topper in English. This historical truth and inheritance always gave the Department an elitist character. There were great teachers in this Department who in their own style carried the mantles of Oxford dons that they reflected in the then "Oxford of the East" of which the English Department could be called the truest representative.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Fields related to Russian.

🕮 SYLLABUS FOR CRET LEVEL-1 IN RUSSIAN

- **Literature**
  - 19th century Russian Literature – The Golden Age
  - 20th century Russian and Soviet Literature – The Silver Age (including the
  - ssian Literary Waves Abroad/Russian Immigrant Literature)
  - Literary Genres – Epic, Drama and Lyric
  - Russian Literary Trends of 19th and 20th centuries
  - Russian Literary Theory and Criticism
  - Post-Modern Russian Literature/Popular Literature
- **Linguistics (including Grammar)**
  - Phonetics
  - Morphology
  - Lexicology
  - Stylistics
  - Syntax
- **Translation/Interpretation**
  - Translation Theory and Practices
  - Challenges of Translation
  - Simultaneous and Consecutive Interpretation
- **Didactics**
  - Various Methodologies and Methods of Teaching
  - Teaching Russian as a Foreign Language
- **Culture and Civilization**
  - History of Russian Society
  - Russian Dynasties
  - Russian Religious Thoughts
  - Russian Culture and Tradition
  - Russian Souvenirs/Paintings/Art and Architecture
  - Geography of Russia (including topography, flora, fauna, minerals, etc.)

45. DEPARTMENT OF SANSKRIT

The Department of Sanskrit at the University of Allahabad, founded in 1872, has a rich legacy spanning 150 years. It offers undergraduate and postgraduate programs, producing skilled scholars and teachers. Notable scholars like Sir Gaṅgānāth Jhā, Prof. Babu Ram Saxena, and Prof. Abhiraj Rajendra Mishra have graced its faculty. Graduates excel in academia, administration, and social work. The department remains at the forefront of education, embracing modern pedagogy and interdisciplinary research. Its achievements include Padma Shri awardees and esteemed vice-chancellors. With a focus on Indian Philosophy, Buddhist philosophy, and more, it continues to shape Sanskrit education in India.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

The fields relted to Sanskrit language and literature.

🕮 SYLLABUS FOR CRET LEVEL-1 IN SANSKRIT

वैदिक सूक्त- सवितृ 1/35, मरुत् 1/85, रुद्र 2/33, मित्र 3/59, उषस् 4/51, मित्रावरुण 7/71, वरुण 7/86, सृष्टि 10/129, अक्षरसूक्त 10/39, मन्त्रार्थ/ सूक्त सारांश

(क) अर्थसंग्रह

(अ) भावना (ब) विधि (स) निषेध

(ख) निरुक्त-(प्रथम अध्याय)

(क) कालिदास (ख) भास (ग) भवभूति (घ) शूद्रक (ङ) विशाखदत (च) भारवि (छ) माघ (ज) श्रीहर्ष (झ) बाण (ञ) सुबुन्ध (ट) दण्डी (ठ) वर्णव्यवस्था (ड) आश्रमव्यवस्था (ढ) नारीशिक्षा

भाषिक वर्गीकरण

आकृतिमूलक, पारिवारिक, भारोपीय, भाषापरिवार, धर्मपरिवर्तन के कारण एवं दिशा अर्थ परिवर्तन के कारण एवम् दिशा, लौकिक, वैदिक एवम् अवेस्ता की भाषा का वैशिष्ट्य, मध्यकालिक भारतीय आर्य भाषा– पालि, प्राकृत, अपभ्रंश

तर्कभाशा–प्रमाण निरुपण पर्यन्त

तत्त्व कौमुदी–कारिक 1 से 21 तक

वेदान्तसार– महावाक्यर्थ

काव्यप्रकाश–(नवम् एवम् दशम् उल्लास)

वकोक्ति, पुनसैतवदाभास, अनुप्रास, यमक, श्लेष, उपमा, रुपक, उत्प्रेक्षा, समासोक्ति, अनन्वय, अर्थान्तरन्यास, दीपक, तुल्ययोगिता, विभावना, विशेषोक्ति, विरोधाभास, दृष्टान्त, निदर्शना, ससन्देह, प्रतिवस्तूपमा, भ्रान्तिमान, परिसंख्या, अपह्नति, अप्रस्तुतप्रशंसा, काव्यलिंग, संसृष्टि, संकर

निम्नलिखित की सिद्धि प्रक्रिया

राम, सर्व, विश्वपा, हरि सखि, क्रोष्टु, भानु, धात, गो, रमा, मति, गौरी, ज्ञान, मधवत्, तद्, अस्मद्, उपनाह, इदम् । तद्धित प्रक्ररण- शैषिकपर्यन्त

निम्नलिखित की सिद्धि प्रक्रिया

(क) भू एवम्, एध् धातु

(ख) कृत्य प्रक्रिया, पूर्वकृदन्त, तुमुन, घत्र, क्त्वा, ल्यप्, ल्युट्

वेद वर्ग

1. ऋगवेद द्वितीय मण्डल के सूक्त (मन्त्रों का अनुवाद, देवताओं की विशेषता)
2. स्वर प्रक्रिया(वैदिक)

3. शुक्ल यजुर्वेद (प्रथत तथा रितीय अध्याय) माध्यन्दिन संहिता
4. वजसनेयि प्रतिशाख्य– एक से तीन
5. शतपथ ब्राह्मण प्रथम काण्ड- (स्रुक सम्मार्जनम् यंन्त)
6. ऋक् प्रातिशाख्य 1, 2, 3, 6 पटल
7. निरुक्त द्वितीय तथा सप्तम अध्याय
8. बहिस्तून शिलालेख

साहित्य वर्ग

काव्य-प्रकाश-(प्रथम से अष्टम उल्लास) कारिकाओं की व्याख्या एवं प्रश्न काव्य-हेतु, काव्य प्रयोजन, काव्य जक्षण, काव्य वेद, अभिहितान्वयवाद एवम् अन्विताधिानवाद, शब्द-शक्तियाँ, ध्वनि भेद, रस सिद्धान्त (रस सूत्र की व्याख्यायें), गुणीभूतव्यंग्य के भेद, व्यंजना की अपरिहार्यता, दोष-स्वरुप, गुणालंकार स्वरूप एवं भेद

ध्वन्यालोक-प्रथम उद्योत- कारिकाओं की व्याख्या एवं प्रश्न ध्वनि के पूर्व कक्ष-स्वरुप एवं खण्डन, ध्वनि स्वरुप, वाच्य एवं व्यंग्य में अन्तर, अलंकारों में ध्वनि के अन्तर्भाव का निषेध, लक्षण एवं व्यंजना में भेद चतुर्थ उद्योत. कारिकाओं की व्याख्या एवं प्रश्न ध्वनि एवं गुणीभूत द्वारा काव्यार्थ की अनन्तता, शुद्ध काच्य की अनन्तता, रस-ध्वनि का महत्व एवं महाभारत के अंगी रस का निर्धारण, काव्य संवाद ।

दशरूपक-कारिकाओं की व्याख्या एवं प्रश्न नाट्यलक्षण, अप्रकृतियाँ, कार्यावस्थायें (सन्ध्यंगो को छोड़कर), अर्थेपक्षेपक नाट्यवृत्तियों, रुपकों के भेद एवं लक्षण, रस, स्वरुप, नाट्य में शान्तरस, रससिद्धान्त खण्डन मण्डन 37वीं कारिका पर्यन्त।

रसगंगाधर-प्रथम आनन (रस-स्वरुप निरुपण पर्यन्त) काव्य लक्षण- पण्डित राज का स्वभिमत, अन्य लक्षणे का आक्षेप

कान्य कारण-प्रतिभा का स्वरुप, प्रतिभा के कारण काव्य भेद- उत्तमोत्तम, उत्तम, मध्यम, अधम

रस-स्वरुप- स्वमतस्थापन, रसविषयक विविध सम्मतियाँ विप्रतिपत्त्यिाँ एवं समाधान नैशधीयचरितम् (प्रथम सर्ग) हिन्दी अनुवाद व्याख्या एवं प्रश्न

शिशुपालवधम्- (प्रथम सर्ग) हिन्दी अनुवाद एवं प्रश्न

नलचम्पू- प्रथम उच्छवास (वर्षावणन पर्यन्त हिन्दी एवं प्रश्न)

रत्नावली- (सम्पूर्ण) हिन्दी अनुवाद, संस्कृत व्याख्या एवं प्रश्न

र्दान वर्ग

1. न्याय सूत्र, वात्स्यायन भाष्य से

(क) प्रमाण (ख) सिद्धान्त (ग) अवयव (घ) वाद, जल्प, वितण्डा (ङ) हेत्वभास

2. प्रशस्तपाद भाष्य

(अ) साधम्यवैधर्म्य (ब) द्रव्य (स) गुण (द) कर्म (य) सामान्य (र) विशेष (ल) समवाय (व) अभाव

3. न्यायसिद्धान्तमुक्तावली से

(अ) मंगलवार (ब) ईश्वर सिद्धि (स) इद्रव्यत्व सिद्धि (द) जाति बाधक (य) कारण (र) अन्यथासिद्ध (ल) लौकिक एवं अलौकिक सन्निकर्ष

1. योगसूत्र व्यास भाश्य से- पाद 1 तथा 2 से निरुपित सभी विषय
2. प्रज्ञा पारमिता
3. माण्डूक्योपनिषद् (कारिका सहित) सम्पूर्ण

1. ब्रह्मसूत्रांकर भाष्य से

(अ) प्रथम अध्याय प्रथम वाद ईक्षत्यधिकरण पर्यन्त

(ब) द्वितीय अध्याय केप्रथम, द्वितीय पाद से न्यायमत, वैशेषिकमत, जैनमत, बौद्धमत, भागवतमत,तथा पाशुपातमत का खण्डन तथा विलक्षणत्वाधिकरण

2. वेदार्थसङ्ग्रह- शांकरमत प्रतिक्षेप पर्यन्त ।

3. पंचदशी- प्रथम प्रकरण से पंचम प्रकरण पर्यन्त ।

46. DEPARTMENT OF SOCIOLOGY

The Department of Sociology, established in June 2010, is dedicated to research in Agrarian studies, Development studies, social movements, Subaltern studies, and Sociology of Health and illness. It has conducted numerous workshops, seminars, lectures, and consultancy programs. Emphasizing practical fieldwork alongside theoretical knowledge, the department encourages PG students to explore diverse sociological aspects. Their curriculum includes in-depth field studies, library research, and comprehensive case studies, fostering a holistic understanding of society. The faculty actively engages students in data collection, coding, analysis, and report writing. The department offers a Ph.D. program and a M.A. program following a CBCS-based semester system.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Sociological Theories, Subaltern Studies, Agrarian Studies, Urban Sociology, Sociology of Sanitation, Religion and Society, Migration Studies, Development Studies, Gender Studies, Social Demography, Sociology of Science and Technology, Social Movements, Knowledge Systems, Urban Ecology, Identity and Indigenous Groups, Women's Movement, Sociology of Minorities, Rural Development, Substance Use Disorder & Epidemic Studies, Tribal Studies, Migration, Women's Studies, and Livelihood Issues.

🕮 SYLLABUS FOR CRET LEVEL-1 IN SOCIOLOGY

Concepts: Community; Institution; Association; Social structure; Social system; Social action; Culture-Cultural change, diffusion, cultural lag, cultural relativism, acculturation; Assimilation; Integration; Social process; Norms and values, Status and role; role conflict; status-set; multiple roles, Role set; Status sequence; Social groups- Primary-Secondary, formal-informal, Ingroupoutgroup, Reference Group; Theories of Socialization, Anticipatory socialization; Conformity and Deviance
Society: Tribal, Rural Urban, Industrial, Post-industrial
Social Institutions: Marriage, Family, Kinship, Economy, Polity, Religion
Social Stratification: Social differentiation, Hierarchy and Inequality; Forms of Stratification: Caste, Class, Gender, ethnic; Theories of social stratification; Social mobility
Social Change: Diffusion, Evolution, Development, Growth, Progress, Revolution, Transformation, Social Development, Theories of social change; Social movements - SC/ST/OBC/others

- **SOCIOLOGICAL THEORIES:**

Structural, Functional, interactionist Symbolic interactionism, Conflict, Phenomenology and Ethnomethodology; Neo-functionalism and Neo-Marxism: Structuration and Post – Modernism

- **RESEARCH METHODOLOGY:**

Meaning of Social Research; Scientific method; Objectivity and Subjectivity, facts, theory and value.
Quantitative methods: Survey, Research Design and its types, Hypothesis, Sampling, Observation, Questionnaire, Schedule, Interview
Qualitative Methods: Participant Observation, Case Study, Content Analysis, Oral History, Life history; Narrations, Conversational analysis
Statistics in Social Research: Measures of Central Tendency; Measures of dispersion; Correlation analysis; Reliability and Validity

- **SOCIOLOGY IN INDIAN CONTEXT:**

Indian society: Uni ty within Diversity
Theoretical Perspectives: Indological, Structural-Functional, Marxian, Civilizational and Subaltern Perspectives.
Contemporary Issues: (Social) Poverty, inequalities, inter- generational conflicts, family

disorganization; (Developmental) slums, displacement, environmental problems (crimes and deviance) White collar crime; corruption; Drug addiction; Suicide

Current Debates: Tradition and Modernity; Nation Building, Secularism, Pluralism Indianisation of Sociology; Privatization of Education; Science and Technology.

- **RURAL SOCIOLOGY:**

Rural-Urban continuum; Part society and part culture, Little Community, Universalization and Parochialization,

Agrarian Institutions: Types of Land ownership; Agrarian relations and Mode of production debate; Jajmani system, differentiation of peasantry; Peasant Studies

Panchayati Raj System: Rural leadership, Factionalism and Empowerment

Rural Social Issues: Bonded and Migrant labour; Agrarian unrest and Peasant movements: Old and New; cultivators' suicides;

Rural Development and Change: Social/Economic factors of Change; Contemporary rural development programmes

- **INDUSTRY AND SOCIETY:**

Concepts: Division of Labour, Bureaucracy, Rationality, Production relations, Surplus value, Alienation

Industry and Society: Factory as a social system; Formal and Informal organization; affect of social structure on industry; Impact of industry on family, education, stratification and class conflict

Industrial Relations: Changing labour-management relations; Worker's participation in Management.

- **SOCIOLOGY OF DEVELOPMENT:**

Concepts: Economic growth, Human development, social development, Sustainable development

Theories of development: Liberal: Dependency: Centre- Periphery; uneven - development; World-system

Paths of Development: Socialist. Mixed, Gandhian, Capitalistic

Consequences of development: ethnic movements, socio-economic disparities

- **GENDER AND SOCIETY:**

Gender as social construct; Social Structure and Gender Inequality; Theories of Gender relations (Liberalist, Radical, Socialist, Post- modernist); Gender and perspectives of Development; Women and Development in India, empowerment of women.

47. DEPARTMENT OF STATISTICS

The Statistics Department, initially part of the Mathematics Department since 1968, gained independence in 2000. Founded under Prof. H. C. Khare's vision, it began with courses taught by Mr. C. C. Pant and later expanded to a team of dedicated faculty members. Dr. G. S. Pandey, Dr. Anoop Chaturvedi, and Dr. S. Lalitha played crucial roles in its growth. The department excels in research, completing notable projects and offering undergraduate, postgraduate, and Ph.D. programs. With a strong focus on statistical theory and applications, students find opportunities in government, industry, and academia. The well-equipped computer lab and specialized faculty enhance the learning experience and support interdisciplinary research.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Fields related to Statistics.

🕮 SYLLABUS FOR CRET LEVEL-1 IN STATISTICS

- **Probability theory**

Probability space of a random experiment, probability measures, random variables as a measurable function, σ-field induced by a sequence of random variables, decomposition of distribution functions in purely discrete, absolutely continuous and singular components, C_r-inequality, Cauchy-Schwartz inequality, Hölderinequality.Minkowski inequality, Jensen inequality, Lyapunov inequality, Kolmogorov inequality, Hajek-Rényki inequality, Sequences of distribution functions, Helly Bray theorem, Different types of convergence of sequence of random variables, distribution function of random vectors, Weak and strong law of large numbers, Khinchin, Borel and Kolmogorov theorems, Borel-Cantelli lemmas and Zero-one law, Characteristic function, Inversion theorem, Continuity theorem, One dimensional central limit problem: Lindeberg-Levy, Lyapunov, Lindeberg-Feller theorems.

- **Matrix Algebra**

Matrix Theory- Inverse of partitioned matrices, g-inverse, orthogonal matrices, properties of idempotent matrices, characteristic roots and vectors, Cayley-Hamilton theorem, quadratic forms, definite, semi-definite and indefinite forms, simultaneous reduction of two quadratic forms, properties of similar matrices.

- **Multivariate Analysis**

Multivariate normal distribution, Characteristic function, Maximum likelihood estimators of the mean vector and covariance matrix, Multiple and partial correlation coefficients and their null sampling distributions, Wishart distribution, Hotteling's T^2, Mahalanobis' D^2 and their applications, Discriminant analysis, Principal components, Canonical correlations and variables, Factor analysis.

- **Statistical Inference**

Radon Nikodym theorem and derivative, Conditional expectation using Radon Nikodymderivarive, Sufficiency, Fisher-Neyman-Halmos-Savage factorization criterion, minimal sufficiency, Completeness, Bounded completeness, Ancillary statistics, Basu's theorem on independence of Statistics, Exponential family, Bhattacharya bound, Chapman Robbins and Kiefer (CRK) bound, Generalized RaoCramér bound for the multiparameter case, Maximum likelihood estimation, Zehna theorem for invariance, Cramér theorem for weak consistency, asymptotic normality, BAN and CAN estimators, asymptotic efficiency, equivariant estimation, relation between confidence estimation and hypothesis testing,GeneralizedNeyman Pearson lemma, UMP tests for distributions with MLR, LR, tests and their properties, UMPU tests, similar regions, Neyman structure, Invariant tests.

- **Design of Experiments**

Analysis of Variance: Two-way classification with equal number of observations per cell and Tukey's test, general two-way classification, Analysis of covariance, 2^n, 3^2 and 3^3 factorial experiments, complete and partial confounding, Balanced Incomplete Block Design (BIBD), construction of BIBD, intra block and inter block analysis, Partially Balanced Incomplete Design (PBIBD), split plot design.

- **Sampling Theory**

Varying probability sampling with and without replacement, cumulative total and Lahiri's methods of selection, Estimation of population mean, Desraj ordered estimates, Horwitz-Thompsom estimator, Midzuno, and Narain system of sampling, post-stratification and deep stratification, double sampling in ratio and regression estimation, two stage and multi-stage sampling, basic idea of randomized response technique, nonsampling errors.

- **Nonparametrics**

Asymptotic distribution of an order statistic, Sufficiency and completeness of n-tuple of order statistic, nonparametric estimation of distribution function and Glivenko-Cantelli fundamental theorem of statistics, one sample and two sample location tests, Application of U-statistic to rank tests, One sample and two sample Kolmogorov-Smirnov tests, Run tests, Pitman ARE.

- **Statistical Decision Theory**

Decision theoretic problem as a game, basic elements, optimal decision rules, unbiasedness, invariance, ordering, Bayes and minimax principles, generalized Bayes rules, extended Bayes rules, admissibility, completeness, minimal complete class, seperating and supporting hyperplane theorems, minimax theorem, complete class theorem, equalizer rules, examples, multiple decision problems, continuous analogue of Bayes theorem, its sequential nature, its need in decision making, basic elements of Bayesian decision theory, theorem on optimal Bayes decision function, corollary for squared error loss function, relationship of Bayes and minimax estimators, least favorable distributions, Bayesian sufficiency, improper prior densities, natural conjugate Bayesian densities, posterior odds ratio, HPD regions, Bayesian inference for normal populations, empirical Bayes procedures.

- **Bayesian Inference**

Subjective probability, its existence and interpretation. Prior distribution, subjective determination of prior distribution. Improper priors, non-informative (default) priors, invariant priors. Conjugate prior families, construction of conjugate families using sufficient statistics of fixed dimension, mixtures of conjugate priors, hierarchical priors and partial exchangeability.

Parametric Empirical Bayes., Bayesian inference: Bayes sufficiency, summary through posterior, predictive inference.

Bayesian decision theory: Bayes solutions for practical decision problems. Point estimation, credible sets, testing of hypotheses. Comparison with classical procedures. Admissibility and minimaxity of Bayes and generalized Bayes procedures.

Ideas on Bayesian robustness, Asymptotic expansion for the posterior density. Bayesian calculation, Monte-Carlo Integration and Markov chain Monte Carlo techniques.

- **Time Series Analysis**

Time series as a stationary or nonstationary stochastic process, time domain analysis based on correlogram, sample autocovariance function (acvf) and autocorrelation function (acf) at lag k, AR(p) process, MA(q) process, mixed ARMA(p,q) process, stationarity and invertibility conditions, ARIMA(p,d,q) model, estimation of parameters, tests for stationarity, frequency domain analysis based on the spectral density function, spectra of AR(1) and MA(1) models, periodogram and its relationship with acvf, forecasting by exponential smoothing and Box-Jenkins procedures.

- **Econometrics**

Linear regression model, assumptions, estimation of parameters by least squares and maximum likelihood methods, tests of hypothesis and confidence estimation for regression coefficients, R2 and adjusted R2, use of extraneous information in terms of exact and stochastic linear restrictions, restricted restriction and mixed regression methods and their properties, point and interval predictors, tests for structural change, use of dummy variables, problem of multicollinearity, consequences and solutions, estimation of parameters by generalized least squares in models with non-spherical disturbances, heteroscedasticity of disturbances, estimation under heteroscedasticity and tests of heteroscedasticity, autocorrelation, Durbin-Watson test, estimation under

autocorrelated disturbances, errors in variable models, inconsistency of least squares method, instrumental variable method, Probit, Logit and Tobit models, seemingly unrelated regression equation (SURE) model and its estimation, simultaneous equations model, concept of structural and reduced forms, problem of identification, rank and order conditions of identifiability, indirect least squares, two stage least squares.

- **Survival Analysis**

Basic terms and their inter-relationships. Various properties of hazard function, censoring and truncation. Kaplan–Meier Survival Curves, Log-Rank Test.Some popular Parametric Survival Models.Basics of Proportional Hazard Models.Basics of Recurrent Event Survival Analysis, Basics of Competing Risks Survival Analysis, Basics of Frailty models**.**

- **Operations Research**

Linear programming problem, simplex methods, duality. Elementary queuing and inventory models. Steady-state solutions of Markovian queuing models: M/M/1, M/M/1 with limited waiting space, M/M/C, M/M/C with limited waiting space, M/G/1.

48. CENTRE OF FASHION DESIGN & TECHNOLOGY

The centre explores the dynamic world of fashion, where cultural heritage meets contemporary trends. With a rich history of textile innovation and craftsmanship, India's influence in global fashion is undeniable. From traditional sarees to modern interpretations by renowned designers like Ritu Kumar, Ritu Beri, and Hemant Trivedi, our department celebrates the fusion of Indian and Western styles. The centre help to embrace the "Look Good, Feel Good" ethos and prepare students to make their mark in this ever-evolving industry. Join us to discover the artistry, elegance, and innovation that define the business of fashion today.

🛠 RESEARCH DOMAINS OFFERED AT THE CENTRE

The fields related to Fashion Design and Technology.

🕮 SYLLABUS FOR CRET LEVEL-1 IN TEXTILE & APPAREL DESIGNING

Unit-I Food Science
Food groups Food preparation Food preservation
Food Science and Food Analysis Food Processing
Unit-II Nutrition Science
Fundamentals of Nutrition Nutritional Biochemistry Food Microbiology
Public Nutrition Therapeutic Nutrition
Unit-III Clothing
Principles of Clothing- Socio- psychological aspects of clothing, selection of fabric and family clothing
Clothing construction- Basic principles of drafting, flat pattern and drape methods Textile design- Principles and concept
Fashion Design- fashion cycle, business and merchandizing Care and maintenance of textiles
Laundry agents- method and equipments
Unit-IV Textiles
General properties of all textile fibers
Processing and manufacturing of all natural and man-made fibers Definition and classification of all natural and man-made fibers
Fabric construction, definition and types of woven nonwoven knitted and other construction techniques
Testing of fibers, yarns and fabric: importance of quality control and research institutes,
Unit-V Human Development
Child development- Principles and stages
Life span development- theories of human development and behavior, child rearing, socialization practices and dynamics
Early childhood care and education- emerging trends
Development problems and disabilities during childhood and adolescence, guidance and councelling Advance child study method and assessment
Womens studies, family Welfare program- recent approaches
Unit-VI Research Methods
Trends in research in Home Science Research Design
Types of Research Sampling Techniques
Selection and preparation of Tools for data collection Types of variables and their selection
Data collection and classification/ coding
Analysis of data through parametric and non-parametric statistics Report writing- presentation of data, interpretation and discussion Research problem- Design and methodology

Teaching methods and aids
Food Science- cereals, pulses, milk and milk product, fruit and vegetables Therapeutic Nutrition
Food preservation and processing Macro and micro nutrients
Fortification, fermentation, supplementation and germination of food. Child and Human development
Human development- rights and perspective Principles and theory of human development
Early child hood care and development- strategies, monitoring and supervision Children with special needs
Intervention programmes
Socialization in various family contexts across the globe Clothing and textiles
Textile chemistry Dyeing and printing
Textile and apparel Industry- fundamentals of business, specification quality control agencies and marketing
Traditional textiles Textile testing
Entrepreneurial competency

49. CENTRE FOR THEATER & FILM

This is the first pan-Asian integrated institute of Theatre and Film in Asia, set up by the University of Allahabad on 14 August 2010. This integrated course in Theatre and Film aims at providing quality education and practical training in the most interdisciplinary way. To equip students with a degree that would turn them into well-qualified professionals and who are fully aware of the various technical and academic aspects of their respective fields.

🛠 RESEARCH DOMAINS OFFERED AT THE CENTRE

Theatre and Film

🕮 SYLLABUS FOR CRET LEVEL-1 IN THEATER & FILM

- **History and Development of Indian Theatre and Cinema:**

Introduction of Natyashastra and Sanskrit theatre, folk theatre, colonial theater, post-independence.
Indian theatre: development of Bangla theatre, Marathi theatre Kannada theatre.
Plays and playwrights.
Development of theatre design.
Playwriting & Adaptation: Natyashastra and its commentaries.

- **World Theatre**

Greek theatre, Roman theatre, Elizabethan theatre– Shakespeare, etc. Modern theatre – naturalism, realism, etc. Contemporary theatre– Brecht, Absurd theatre, etc. theatre of China, theatre of Japan and other Asian theatre. Commercial theatre.

- **World Cinema**

The development of cinema and its techniques. Development of Indian, Asian and Western cinema.
Themes in Indian cinema: mythological, religious, social issues, etc.
Neorealism, expressionism in cinema, etc. Parallel cinema, Russian, American, German, Japanese, Iranian, Italian cinema, etc.
New medium & narratives of OTT: Netflix, Amazon, Hot Star, etc.

- **Acting**

Elements of acting, rasa theory, Stanislavsky system of acting– realistic acting, Myerhold, Brecht, etc.
Basic camera angles/shots, camera acting.
Traditions of performance (Asia, India & World): Introductory knowledge of different forms of performing traditions in India.

- **Aesthetics**

Medieval World and Indian Art Period: Anandvardhan, Abhinavgupt, Renaissance in Art, Literature and Music, etc. Modern Aesthetics, Different Discourses and Movements, Modern Art, and Literature, etc. Post Modern art and theories.
Central Asian performing traditions, South Asian performing traditions.
Introduction to Film Making (Direction, Camera, Editing & Sound)
Production process, direction, basics of camera- operation & technology, screenplay, basics of sound recording (digital)- operation & technology and editing. Basic programmes&softwares (digital) and editing.
Role and Function of Director, production responsibilities, post production procedures, autonomous crew responsibility of all departments & team.
Screen Play Writing and Scripting (Film).

- **Cinematography**

Introduction: writing with motion, Forces of visual organization, Miscellaneous rules of composition, Controlling the light and color, color balance with gels and filters, color temperature, light balancing gels, conversion gels, color correction gels. Cinematographic practice for film.

Brief history of editing, equipment required in editing: celluloid & digital, editing of different scenes and editing choices. understanding narrative and various types of storytelling, time, and space in cinema.

50. DEPARTMENT OF URDU

The Department of Urdu, established in 1924, holds the distinction of being India's oldest. Professor Zamin Ali served as its first head and professor. Over the years, it boasted notable educators like Prof. Ejaz Husain, Prof. Ehtesham Husain, Prof. Gyan Chand Jain, and Prof. S. M. Aquil. Its students included renowned writers such as Balwant Singh, Razia Sajjad, Zaheer, Shameem Haufi, and Fuzail Jafri. The department is renowned for its rich cultural and academic heritage. Currently led by Prof. A. A. Fatmi, it continues to shine with 13 faculty members and approximately 500 students enrolled in undergraduate and postgraduate programs.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

All thurst area of Urdu literature as per need.

🕮 SYLLABUS FOR CRET LEVEL-1 IN URDU

(Masnavi & Qasida)
Masnaui: Qutub Mushtari, Bajal Kahani, Sahrul Bayan, Gulzar e Naseem, ZaheIshq, Saqinama-
Qasida: 1 Uth Gaya Bahman o day Ka Sauda
2 Zahe Naseeb Agar KeejyeZauq
3 Dherguzjaluaiyaktai Ghalib
4 Samka se chala Mohsin
(Darama& Afsana)
Darama: 1 Inder Sabha Anand
2 Silver King Agha Hasher
3 Anar Kali Imtiaz Ali Taj
4 Tawliy Upendra Nath Ashk
5 Zahak Mohd Hasan
Afsana: 1 Prem Chnd, Krishma Candra, Minto, Bedi, Ismatchughtai.
Q.A. Haider. (Marsiya)
1 QasamKahe Di khao Satahi Hashim Ali
2 Kaha Ashk ne yunJethkeSauda
3 Kis Noor ki Majlis men Zameer
4 BakhudaFase Mandan Anees Jab Qate ki Musafati Shab Anees
5 Paida Shua e Maher ki Dabeer
6 Husavi Aur Inqilab Josh
7 Sham e Ghareeban Javed Mazhari
8 Islam Dean Azmat Ali Raza
(Tareekh Urdu Zaban o Adab)
1 Difinaten of Langvage.
2 Family of Language.
3 College of Urdu (Forteilliam, Delhi College)
4 Ali Garh Tahreek
5 TaraqqiPasand Tahreek
6 Age of Ghalib
7 Dilhi School of Poetry
8 Lucknow School of Poetry
9 Modern age of Litt.

10 Age of Iqbal

(Ghazal)

Wali, Meer, Dard, Atish. Nasikh, Ghalib, ShjaedFami, Badayuni, Hasrat, FiraqGorakhpuri, Faiz, Nasi Kazmi-

(Nazm)

NazarAkbarabadi: Holi ki Baharen, Barsat ki Baharen, Jadey ki Baharen, Kaljag, Admi Nama, Baldev ji ka mela, Share Ashob.

Hali: Intikhab U.P. Urdu Academy

Akbar Allhabadi: British Raj, Barg w Kaleem, Labe Sahil Mauj, Khuda Hafiz.

Chakbast: FaryadeQaum, Khake Hind, Phool Mala, Alviday, Phool Mala, Gokhle.

Iqball: Tulua Islam, Shma o Sahar, Masjid e Qurtuba, Zauq o Shauq, Shauq-e-Ummeed, Jebreel o Iblees.

Josh: Baghawat, Rishwat, Naqqad, Fitr e Khanqah, JangalkeShahzadi, Fakhta ke Awaz.

Faiz: All Poems of Daste Saba

Majaz: Awara, Rat aur Ratin.

Sardar Jafri: Ek khwabaur, Zindagi, Salam. Arzoo ke Sanam Khane.

Makhdoom: Yad Hai. Intizar. Hareli. Jang. Qzadi.

(Dastan aur Nawel)

(Dastan)
1 Bagh o Bahar Meer Amman
2 FasanaiAjaifRajjab Ali
3 Gulshane Nau BaharMehjoor
4 Fasanai Azad R.N. Shar Sher

(Nowel)
1 Taubatun Nasooh Nazeer
2 Firdaus Bareen A., H. Saroor
3 Umrao Jaan Ada HadiRuswa
4 GauDaanPremchand
5 TeerhiLakeerIsmatchughtai
6 Aag ka darya Q.A. Haider

(Tanqeed)

Mashriq aur Maghrib

Tanqeed ki Qismin

School of Tanqeed

Practical of Criticsim

Hali, Shibli, Azad, Ehtisham Husaini, Kaleemuddin Ahmad,

Ali Ahmad Sarver etc.

1 Ghalib
2 Iqbal
3 Prem chand
4 Meer Anees

51. DEPARTMENT OF ZOOLOGY

Established in 1906, the Department of Zoology has been a cornerstone in the field. It marries a storied history with a commitment to innovation. The department has been guided by a series of visionary leaders, starting with founders Prof. Homersham Cox and Prof. F.M. Howlett, followed by a lineage of eminent scholars, including Prof. A.D. Imms, Dr. W.N.F. Woodland, Prof. D.R. Bhattacharya, Prof. H.R. Mehra, Prof. M.D.L. Srivastava, Prof. U.S. Srivastava, and Prof. H.R. Singh. A succession of eminent Professors-cum-Scientists of the Department have continued this legacy.

Today, the Department is a node of cutting-edge research, fostering expertise in a broad spectrum of specialized fields. The Department is also making significant strides in emerging fields such as proteomics, genomics, cancer biology, and neuroscience, all while maintaining a strong foundation in established domains like biochemistry, endocrinology, cell biology, and entomology. Thus, the Department is a guiding light toward a future replete with groundbreaking discoveries and advancements in zoological studies, ready to shape the dynamic future of zoology with innovation and excellence.

🛠 RESEARCH DOMAINS OFFERED AT THE DEPARTMENT

Developmental Neuroscience, Neuroendocrinology, Neuropharmacology, Avian Reproductive and Stress Physiology, Biochemistry, Cognitive Neuroscience, Reproductive Endocrinology, Molecular Biology, Genetics, Toxicology, Proteomics, Artificial Intelligence, Arachnology, Chronobiology, Cancer Biology Chemoprevention, Fish Biology, Molecular Parasitology, Bioremediation, Toxicology, Microbiology, Gut Microbiome.

🕮 SYLLABUS FOR CRET LEVEL-1 IN ZOOLOGY

- Principles of taxonomy as applied to the systematics and classification of the animal kingdom Classification and interrelationship amongst the major invertebrate phyla; Minor invertebrate phyla, Functional anatomy of the nonchor dates; Larval forms and their evolutionary significance.
- Classification and comparative anatomy of protochordates and chordates; Origin, evolution and distribution of chordates groups: Adaptive radiation.
- Histology of mammalian organ systems, nutrition, digestion and absorption; Circulation (open and closed circular, lymphatic systems, blood composition and function); Muscular contractor and electric organs; Excretion and osmoregulation: Nerve conduction and neurotransmitters major sense organs and receptors; Homeostatic (neural and hormonal); Bioluminescence Reproduction.
- Gametogenesis in animals: Molecular events during fertilization, Cleavage patterns and fate maps, Concepts of determination, competence and induction, totipotency and nuclear transfer experiments: Cell differentiation and differential gene activity: Morphogenetic determinants in egg cytoplasm; Role of maternal contributions in early embryonic development: Genetic regulations of early embryonic development in Drosophila; Homoerotic genes.
- Feeding, learning, social and sexual behaviour of animals; Parental care; Circadian rhythms; Mimicry; Migration of fishes and birds; Sociobiology; Physiological adaptation at high attitude.
- Important human and veterinary parasites (protozoans and helminthes); Life cycle and biology of Plasmodium, Trypanosome, Ascaris, Wuchereria, Fasciola, Schistosoma and Leishmania; Molecular, cellular and physiological basis of host – parasite interactions.
- Arthropods and vectors of human diseases (mosquitoes, ice, files and ticks); Mode of transmission of pathogens by vectors; Chemical, biological and environmental control of anthropoid vectors: Biology and control of chief insect pests of agricultural importance; Plant host–insect interaction, insect post management; useful; silkworm.

- The law DNA constancy and C–value paradox; Numerical, and structural changes in chromosomes; Molecular basis of spontaneous and induced mutations and their role in evolution; Environmental mutagenesis and toxicity testing: Population genetics.
- Structure of pro–and eukaryotic cells; membrane structure and function; intracellular compartments, proteinsorting, secretary and endocytic pathways; Cytoskeleton; Nucleus; Mitochondria and chloroplasts and their genetic organisation; cell cycle; Structure and organisation of chromatin, polytene and lamphrush chromosomes; Dosage compensation and sex determination and sex–linked inheritance.
- Interactions between environment and biota; Concept of habitat and ecological riches; Limiting factor; Energy flow, food, chain, food web and tropic levels; Ecological pyramids and recycling biotic community-concept, structure, dominance, fluctuation and succession; N.P.C. and S cycles in nature.
- Ecosystem dynamics and management; Stability and complexity of ecosystems; Speciation and extinctions; environmental impact assessment; Principles of conservation; Conservation strategies; sustainable development.
- Physico–chemical properties of water; kinds of aquatic habitats (fresh water and marine): Distribution of and impact of environmental factors on the aquatic biota; Productivity, mineral cycles and biodegradation in different aquatic ecosystems; Fish and Fisheries of India with respect to the management of estuarine, coastal water systems and man–made reservoirs: Biology and ecology of reservoirs.
- Structure, classification, genetics, reproduction and physiology of bacteria and viruses (of bacteria, plants and animals); Mycoplasma protozoa and yeast (a general accounts).
- Microbial fermentation: Antibiotics, organic acids and vitamins; Microbes in decomposition and recycling processes; Symbiotic and asymbiotic N2–fixation; Microbiology of water, air, soil and sewage: Microbes as pathological agents in plants, animals and man; General design and applicants of a biofermenter, Biofertilizer.
- Antigen: Structure and functions of different clauses of immunoglubulins; Primary and secondary immune response; Lymphocytes and accessory cells; Humoral and cell mediated immunity: MHC; Mechanism of immune response and generation of immunological diversity; Genetic control of immune response. Effector mechanisms: Applications of immune response, Effector, mechanisms: Applications of immunological techniques.
- Enzyme Kinetics (negative and positive cooperativity): Regulation of enzymatic activity; Active sites; Coenzymes: Activators and inhibitors, isoenzymes, allosteric enzymes; Ribozyme and abzyme.
- Van-der-Waal's electrostatic, hydrogen bonding and hydrophobic interaction; Primary structure and proteins and nucleic acid; Conformation of proteins and polypeptides (secondary, Tertiary, quaternary and domain structure); Reverse turns and Ramachandran plot; Structural polymorphism of DNA, RNA and three-dimensional structure of rRNA; Structure of carbohydrates, polysaccharides, glycoproteins and peptido–glycans; Helixoll transition; Energy terms in biopolymer conformational calculations.
- Glycolysis and TCA cycle: Glycogen breakdown and synthesis; Gluconeogenesis; interconversion of hexoses nad pentoses; Amino acid metabolism; Coordinated control of metabolism; Biosynthesis of purines and pyrimidines; Oxidation of lipids; Biosynthesis of fatty acids; Trigycerides; Phospholipids; Sterols.
- Energy metabolism (concept of free energy); Thermodynamic principle in biology; Energy rich bonds; Weak interactions; Coupled reactions and oxidative phosphorylations; Group transfer; Biological energy transducers; Bioenergetics.
- Fine structure of gene, Eukaryotic genome organisation (structure of chromatin, cooling and non– cooling sequences, satellite DNA); DNA damage and repair, DNA replication, amplification and rearrangements.
- Organization of transcriptional unit; Mechanism of transcription of prokaryotes and eukaryotes; RNA processing (capping, polyadenylation, splicing, introns and exons); Ribonucleoproteins, structure of mRNA; Genetic code and protein synthesis.
- Regulation of gene expression in pro and eukaryotes; Attenuation and antitermination; Operon concept; DNA methylation; Heterochromatization; Transposition; Regulatory sequences and transacting factors; Environmental regulation of gene expression.
- Bichemistry and molecular biology of cancer; Oncogenes; chemical carcinogenesis; Genetic and metabolic disorders; Hormonal imbalances; Drug metabolism and detoxification; Genetic load and genetic counseling.
- Lysogeny and lytic cycle in bacteriophages; Bacterial transformation; Host cell restriction; Transduction;

Complementation; Molecular recombination; DNA ligases; Topoisomerases; Gyrases; Methylases; Nucleases; Restriction endonucleases; Plasmids and bacteriophage base vectors for cDNA and genomic libraries.

- Principles and methods of genetic engineering and Gene targeting; Applications in agriculture, health and industry.
- Cell and tissue culture in plants and animals; Primary culture; Cell line; Cell clones; Callus cultures; Somacional variation; Micropropagation; Somatic embryogenesis; Haploldy; Protoplast fusion and somatic hybridization; Cybrides; Gene transfer methods in plants and in animals; Transgenic biology; Allopheny; Artificial seeds; Hybridoma technology.
- Structure and organisation of membranes; Glycoconjugates and proteins in membrane systems; ion transport, Na+ / K+ ATPase; Molecular basis of signal transduction in bacteria, plants and animals; Model membranes; Liposomes.
- Principles and application of light phase contrast, fluorescence, scanning and transmission electron microscopy, Cytophotometry and flow cytometry, fixation and staining.
- Principles and applications of gel-filtration, ion–exchange and affinity chromatography; Thin layer and gas chromatography; High pressure liquid (HPLC) chromatography; Electrophoresis and electrofocussing; Ultracentrifugation (velocity and buoyant density).
- Principles and techniques of nucleic acid hybridization and Cot curves; Sequencing of Proteins and nucleic acids; Southern, Northern and South–Western blotting techniques; Polymerase chain reaction; Methods for measuring nucleic acid and protein interactions.
- Principles of biophysical methods used for analysis of biopolymer structure X–ray diffraction, fluorescence, UV, ORD/CD, Visible, NMR and ESR spectroscopy; Hydrodynamic methods; Atomic absorption and plasma emission spectroscopy.
- Principles and biophysical methods used for analysis of biopolymer structure, applications of tracer techniques in biology; Radiation dosimetry; Radioactive isotopes and half life of isotopes; Effect of radiation on biological system; Autoradiography; Cerenkov radiation; Liquid scintillation spectometry.
- Principles and practice of statistical methods in biological research, samples and populations; Basic statistics–average, statistics of dispersion, coefficient of variation; standard error; Confidence limits; Probability distributions (biomial, Poisson and normal; Tests of statistical significance; Simple correlation of regression; Analysis of variance).

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HELP DESK

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Helpdesk Number : 9453819486

Call Centre Timing: 10:00 AM to 07:00 PM *(All Days)*