Email : helpdesk.aupravesh2019@gmail.com
Helpdesk Number : Tolled No. : +91 9453827208
Tollfree No. : 18001805643

UNIVERSITY OF ALLAHABAD

INFORMATION AND GUIDELINES FOR

COMBINED RESEARCH ENTRANCE TEST (CRET) - 2019

Please refer www.aupravesh2019.com or Admission-2019 link of www.allduniv.ac.in for more detail

IMPORTANT NOTE

1. The applicant must take due care while filling up the form (online). The information provided by the applicant in his/her form shall not be changed or altered in any case and the University will not entertain such requests under any circumstance. The University shall not be liable for any mistake made by the applicant.
2. In case if the number of registered candidates at any of the examination centres is less than 100 (One Hundred), then in such case the registered candidates will be allotted the nearest centre.
3. There is no provision of revaluation/scrutiny.
4. In case of any discrepancy in the Hindi version, the English version of the brochure will be treated as correct version.
5. Only such RTI applications shall be entertained which are received within 60 days from the declaration of final result.
6. Each candidate will also have to mention his / her Sub-Category alomgwith his / her overall category i.e. UR, SC, ST, OBC and EWS.
7. The minimum qualifying marks in CRET written examination shall be 50% for unreserved candidates and 45% for OBC, SC, ST and Different Abled (PH) candidate.
8. Every candidate will have to declare any disciplinary action/police action against him.
9. **The TEST FEES prescribed for Different Categories of Candidates for CRET-2019 are as follows:**
   Unreserved / OBC : Rs. 1600/-
   SC / ST / PH : Rs. 800/-
10. There is no negative marking in Section-I.

SCHEDULE

The schedule of CRET-2019 has been as under:

Start date of registration and submission ONLINE	**Friday, 12 April, 2019**
Last date of Registration, Fee Deposition and Form Submission ONLINE	**Friday, 03 May, 2019**
Downloading of Admit Cards Online only	**One Week before the Admission Test**
Date of Entrance Test	**20 May to 22 May, 2019 Monday to Wednesday**

The University of Allahabad shall conduct COMBINED RESEARCH ENTRANCE TEST-2019 (CRET-2019) at Allahabad for admission to the degree of Doctor of Philosophy (Ph.D.) (hereinafter referred to as Ph.D. Programme) of the University of Allahabad for the session 2019-20 in the subjects specified in SECTION 2 of this Bulletin.

As laid down in the Ordinance LVI of the Second Revised Ordinance of Allahabad University (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 fulfill other prescribed conditions of eligibility.

Regular teachers of the University of Allahabad and of any institution maintained by it or admitted to its privileges and international Students are exempted from appearing at CRET for admission to Ph.D. Programme. All other candidates for admission to the Ph.D. Programme in the concerned subjects are required to appear at CRET-2019 after applying and register their candidatures through the ONLINE APPLICATION AND REGISTRATION PROCESS at the website www.aupravesh2019.com OR Admission-2019 link of www.allduniv.ac.in and remitting the admissible Test Fee in the prescribed manner.
The details and instructions in respect of CRET-2019, the procedure applicable to the teachers and international Students exempted from CRET-2019 and relevant information on the Ph.D. Programme are set out in the following sections of this Bulletin.

- **SECTION 1 : GENERAL INFORMATION**
- **SECTION 2 : PROVISIONS IN RESPECT OF THE SUBJECTS FOR CRET-2019**
- **SECTION 3 : THE ONLINE APPLICATION AND REGISTRATION PROCESS, SCHEDULE AND TEST FEES FOR CRET-2019**
- **SECTION 4 : GENERAL INSTRUCTIONS**
- **SECTION 5 : INTERVIEW**
- **SECTION 6 : IMPORTANT INSTRUCTIONS TO THE CANDIDATES**

SECTION 1

GENERAL INFORMATION

1.01. All candidates seeking admission to the Ph.D. Programme of the University of Allahabad for the session 2019-20, in the subjects listed in para 2.01 (of Section 2), shall have to qualify in the COMBINED RESEARCH ENTRANCE TEST (CRET-2019) to be conducted by the Allahabad University at Allahabad.

1.02. All candidates, shall be required to fulfill the following **ELIGIBILITY CRITERIA** for appearing in CRET-2019 and for admission to the Ph.D. Programme.

1.02.1 A minimum score at the Post-graduate Examination of 55% marks (or the equivalent Letter Grade/Grade Point under the seven point Letter Grade Scale), laid down by the UGC in **the case of General candidates and 50% marks (or the equivalent Letter Grade / Grade Point) in the case of OBC / SC / ST / PH 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.**

1.02.2 A minimum average score in the entire academic career of 54% marks (or the equivalent Letter Grade/Grade Point) in the case of General/OBC candidates; or 49% marks (or the equivalent Letter Grade/Grade Point) in the case of SC / ST / PH candidates. For the purposes of Criterion 1.02.2, the average percentages score of the candidate shall not be rounded-off to the next higher integer.

1.02.3 Not more than one III division (or equivalent Letter Grade/Grade Point) in the academic career before graduation.

1.02.4 A candidate having III division (or equivalent Letter Grade/Grade Point) at the graduate and post-graduate examinations shall not be considered for admission to Ph.D. Programme.

Note : A candidate who does not fulfill the aforesaid Criteria 1.02.1 to 1.02.4 shall not be eligible to apply for and to appear in CRET-2019 and to be admitted to the Ph.D. Programme.

1.03 The CRET 2019 is divided into two parts: Paper I & Paper II

1.03.1 **Level-I** of CRET-2019 Test will consist of two papers. **Paper I** will have 50 objective type questions of 2 marks each. As per UGC Regulation, 50% of the questions would be from Research Methodology and 50% will be subject Specific i.e. 25 questions from Research Methodology and 25 question from subject specific. There shall not be any negative marking. Paper II will have subjective type questions with small, medium and large type answers: The duration of Paper I And II will be 30 Min and 120 Min 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 above information is also given in the Table-1

Table -1: Level-1 Details

Paper	Marks	Number of Questions	Duration
I	100	50	30 min
II	200	03	120 min

In Paper-II, all questions shall be from the subject opted/selected by the candidates. In this paper 3 questions are to be asked as per details shown in Table-2.

Table-2

Question No.	Number of Parts	Marks of each part	Total marks
1	10	10	100
2	2	30	60
3	1 or 2 (Optional)	40 / 20	40

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. The following categories of candidates shall be exempted from the **Level 1** Test:

1.04.1 Teacher of the University or Constituent Colleges candidate for Ph.D.

1.04.2 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 1 and be separately assessed at level 2 against a specified number of vacancies.

1.05.1 Reservation in Ph.D. Programme shall be implemented, as per MHRD/UGC directions, Government Orders, and guidelines. There shall be reservation 15% seats for the Scheduled Caste (SC), 7.5% for the Scheduled Tribe (ST) and 27% for the Other Backward Class (OBC) Categories. A horizontal reservation of **5%** shall be extended, **across the reserved and unreserved categories, for the Physically Handicapped (PH) candidates in accordance with the relevant provisions in this regard.**

1.05.2 10% of reservation may be given to Economically weaker Section (EWS) candidates. However the reservation for these candidate is subject to decision of the University, guidelines issued by the Central Government, Rules and Regulations laid down by the UGC and any decision of the Hon'ble Supreme Court of India.

1.05.3 There will not be any deduction of marks for gap years.

1.06 There shall be category-wise minimum qualifying marks for level 1 Test, as given below.

MINIMUM QUALIFYING MARKS AS PER UGC REGULATION, 2016

For General Category candidates	**50 % of 300= 150**
For OBC, SC / ST / PH Category candidates	**45 % of 300= 135**

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

1.07.2 A list of eligible candidates for the Level 2 Tests shall be drawn up, in according with the considerations specified in sub-para 1.08.4, from amongst the following categories of candidates fulfilling the eligibility Criteria (vide para 1.02)

1.07.3 **A LIST OF ELIGIBLE CANDIDATES** for the Level 2 Test shall be announced by the CRET-2019 Committee on the basis of the following considerations:

Vacancies in any Department / Institute / Centre / unit in any session will depend on the number of approved research supervisors of the subject/unit/centre concerned. As such, CRET 2019 Committee shall determine the number of vacancies as intimated by the respective Head/Coordinator of the Department / Centres in the respective subject / unit / centre concerned. 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 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. The seats may be available for Ph.D. Admission in certain cases of the Constituent College of the University. The detail will be announced/declaration by the University at the time of declaration of result.

1.07.4 Against each vacancy two candidates will be qualified for Level 2 (Academic Council Resolution No. 02/19 dated 15th May 2016).

1.08 For CRET Admission 2019, In accordance with the new Regulation and Ordinance for CRET, the 70% of weightage will be given to the written examination and 30% to the Interview. The final result shall be drawn on the basis of following :

Degree	Marks	A.P.	Maximum
1. High School	**Less than 50%**	**0**	**2**
	More than 50% but less than 60%	**1**	
	More than 60%	**2**	
2. Intermediate	**Less than 50%**	**1**	**3**
	More than 50% but less than 60%	**2**	
	More than 60%	**3**	

3. Undergraduate	**Less than 50%** **More than 50% but less than 60%** **More than 60%**	**2** **3** **5**	**5**
4. Postgraduate	**Less than 55%, but more than 50%** **More than 55% but less than 60%** **More than 60%**	**5** **7** **10**	**10**
5. National Level Test	**SLET/NET or equivalent** **JRF**	**3** **5**	**5**
6. Entrance Test Marks	**Marks obtained in Entrance Test to be converted in Thirty five**		**35**
7. Interview			**15**
	TOTAL MARKS		**75**

1.09 Regularly appointed teachers of the University of Allahabad (including University Institutes and Independent Centres of the University of Allahabad) or of any Constituents Institute or Constituent College of the University of Allahabad, desirous of admission to the Ph.D. programme in their respective subjects, should submit, on or before June 15, 2019, their application on the Application Form available in the Office of the Registrar, University of Allahabad, prescribed 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, to the Registrar, University of Allahabad. The 'Registrar shall record these Forms and forward them to the Head of the concerned Department (in the case of teachers of a Department of the University or of a Constituents College) or to the Director of the concerned Institute (in the case of teachers of a University Institute or a Constituent Institute).

1.09 (A) International students and serving Army, Navy & Air Force Officer as mentioned in 1.04.2 should also submit application form on or before June 15, 2019.

1.10 International Students seeking admission to the Ph.D. Programme should contact the international Students Advisor of the University, who shall issue appropriate instructions to such of them who fulfill the qualifications for being considered for admission to the Ph.D. Programme. The cases of International Students 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 Students may be different from that for the candidates qualifying CRET-2019 and the teachers referred to in para-1.09.

1.11 All candidates (except the regularly appointed teachers and international students referred to in paras 1.09 and 1.10), should apply to the Director, Admissions-2019 through the **ONLINE APPLICATION AND REGISTRATION PROCESS** from the website www.aupravesh2019.com OR Admission-2019 link of www.allduniv.ac.in, in accordance with the instructions set out in SECTION 3.

1.12 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 of the Second and Revised Ordinances of the University of Allahabad and other relevant Ordinances, Regulations and rules of the University of Allahabad.

1.13 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. The course fee for the Pre Doctoral Programme may be chargeable to the Contingency Grant of candidates in receipt of a Fellowship/Scholarship/other stipend.

1.14 Final admission to the Ph.D. Programme shall be granted to the candidates only upon the successful completion of the Pre-Doctoral Programme of the duration of one Semester.

1.15 Under the provisions of clauses I(c) and 4(a) of the Ordinance LVI of the Second and Revised Ordinances of the University of Allahabad. All candidates admitted to the Ph.D. Programme are required to pursue a course of research of duration of not less than 36 months, in residence within the territorial area of the University (i.e, the area within a radius of 16 kilometers from the Convocation (Senate) Hall of the University).

1.16 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 1.09) 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 fulfill the requirement of residence within the area.

1.17 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 1.16. 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.

1.18 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. The University sould not provide any Scholarship or Financial benefit ot 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-1.09 or by the employed candidates referred to in para 1.16.

1.19 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 whole-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.

1.20 From this Academic Session 2019-20, every applicant (except teacher/Int. Student) have to appear in the CRET Examination. As per UGC Regulation, 2016, it is necessary to give weightage to the written marks also, therefore all applicants including JRF have to appear in Level-I i.e. written examination also.

SECTION 2

PROVISIONS IN RESPECT OF THE SUBJECTS FOR CRET-2019

2.01 CRET-2019 shall be conducted in the **Subjects** mentioned in the Table-3

Table-3 : SUBJECTS FOR CRET-2019

Sl. No.	SUBJECTS	AU	CMP	ADC	ISDC	SPM	SSK	AKDC	JT	Total Number of Seats
1.	Agriculture Botany	00	-	-	-	-	-	-	-	00
2.	Agriculture Chemistry	02	-	-	-	-	-	-	-	02
3.	Ancient History	05	06	-	08	-	06	-	-	25
4.	Anthropology	01	-	-	-	-	-	-	-	01
5.	Arabic	00	-	-	-	-	-	-	-	00
6.	Atmospheric & Ocean Science	04	-	-	-	-	-	-	-	04

7.	Behavioural & Cognitive Science	05	-	-	-	-	-	-	-	05
8.	Biochemistry	03	-	-	-	-	-	-	-	03
9.	Bio-Informatics	02	-	-	-	-	-	-	-	02
10.	Biotechnology	04	-	-	-	-	-	-	-	04
11.	Botany	12	30	-	-	-	06	-	-	48
12.	Chemistry	07	42	-	-	-	06	-	-	55
13.	Commerce and Business Administration	25	12	-	08	10	-	-	-	55
14.	Computer Science	16	-	-	-	-	-	-	-	16
15.	Defence & Strategic Studies	01	-	04	02	06	-	-	-	13
16.	Design and Innovation in Rural Technology	06	-	-	-	-	-	-	-	06
17.	Development Studies	04	-	-	-	-	-	-	-	04
18.	Economics	Awaited	-	02	06	-	-	-	-	Awaited
19.	Education	01	16	-	08	-	-	04	-	29
20.	Electronics Engg. Or Allied Subjects (Exemption from Level-1 Test)	09	-	-	-	-	-	-	-	09
21.	English	16	10	-	06	-	-	-	-	32
22.	Environmental Sciences	04	-	-	-	-	-	-	-	04
23.	Food Technology	00	-	-	-	-	-	-	-	00
24.	Geography	02	08	-	-	-	-	-	-	10
25.	Geology / Applied Geology / Geo-Physics (Earth & Planetary Sciences)	09	-	-	-	-	-	-	-	09

26.	Hindi	62	10	04	08	-	06	-	-	90
27.	History (Med. & Modern)	10	-	-	10	-	-	-	-	20
28.	Home Science	07	-	-	-	-	-	-	-	07
29.	Law	04	18	-	-	-	-	-	-	22
30.	Material Science	12	-	-	-	-	-	-	-	12
31.	Mathematics	04	-	-	-	-	-	-	-	04
32.	Music & Performing Arts	06	-	-	-	-	-	-	-	06
33.	Nutritional Science	00	-	-	-	-	-	-	-	00
34.	Persian	04	-	-	-	-	-	-	-	04
35.	Philosophy	05	-	-	-	-	-	-	-	05
36.	Physical Education	04	-	-	-	-	-	-	-	04
37.	Physics	11	-	-	-	-	-	-	-	11
38.	Political Science	12	14	-	10	08	-	08	-	52
39.	Psychology	04	-	-	-	-	-	-	-	04
40.	Sanskrit	00	10	-	-	-	-	-	08	18
41.	Sociology	01	-	-	10	-	04	-	-	15
42.	Statistics	00	-	-	-	-	-	-	-	00
43.	Urdu	00	-	-	-	-	-	-	-	00
44.	Visual Arts / Painting	04	-	-	-	-	-	-	-	04
45.	Zoology	01	28	-	-	-	04	-	-	33

NOTE : i. Number of seats may vary in different Departments as per availibility of Supervisior.

ii. Teacher candidate of the University or Constituent Colleges /International student must apply through Online Form. Teacher candidate shall after downloading the Filled Form, submit the hardcopy of the Application Form duly endorsed by the Registrar or Principal of the College or Director of the Institute as the case may be, to the Office of Director Admissions 2019. However, Teacher Candidates and International Students are Exempted for CRET Level-I.

2.02 The University reserves the right to withdraw any of the subjects specified in para 2.01 from CRET-2019 without assigning any reason. The vacancies in certain subject of Ph.D. on the Constituent College may be the announced at the time of declaration of result. But

the University reserves the right to not allow admission for Ph.D. in any subject in the Constituent College.

2.03 A candidate is entitled to appear for the Level 1 Test at CRET-2019 in only one subject being the subject in which he / she has passed the Post-Graduate examination or (where such subject is not included in the list given in para 2.01) in a subject that is admissible in this regard, on account of having been recognized by the University of Allahabad' as equivalent to the subject of the candidate at the Post-graduate examination or as having a variation merely in name and not in substance from the latter.

NOTE:

i. The candidate is advised to satisfy himself/ herself of the admissibility of the subject of his/her' Post-Graduation for the purposes of appearing with a particular Subject at CRET- 2019.

ii. In case any question arises regarding the admissibility of the subject of a candidate at the Post Graduate examination for the purposes of appearing with a particular Subject at CRET 2019, the CRET -2019 Committee shall take a final decision on the recommendation of the Doctoral Programme Committee concerned, and such decision shall be binding on the candidate.

2.04 A candidate eligible to appear at the Level 2 Test of CRET-2019 and desirous of pursuing research in an inter-disciplinary area in which an approved Ph.D. Programme is offered by a Department/Centre/unit or an Institute, shall be allowed to pursue such inter-disciplinary Ph.D. Programme only if the CRET-2019 Committee and the relevant Doctoral Programme Committee (DPC) have permitted to pursue such Ph.D. Programme., In such a case, the candidate shall be required to submit, in original, the Certificate of Eligibility, issued by CRET-2019 Committee along with other requisite documentation to such DPC for the concerned Inter-disciplinary area.

2.05 Before applying for CRET 2019 and appearing at any level, thereof, candidate must satisfy himself/herself that he/she fulfills 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, 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).

2.06 If a candidate fails to mention, in his/her On-line Application Form, the subject in which he/she wants to appear for CRET-2019, 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-2019 (at any Level) in a subject that is not admissible to him/her, his candidature shall be liable to be rejected.

2.07 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-2019 (at any Level) in a subject that is not admissible to him/her in terms of para 2.03, his candidature shall be liable to be rejected and he shall not be entitled to claim any relief or other concession in that regard.

2.08 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

THE ONLINE APPLICATION AND REGISTRATION PROCESS, SCHEDULE AND TEST FEES FOR CRET-2019

3.01. A candidate who fulfils the minimum Eligibility Criteria (vide para 1.02), and seeks to appear in CRET-2019 in a Subject that is available and is also admissible to him/her (vide paras 2.01 and 2.03), must complete, and submit through the Internet, 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-2019 in the concerned / admissible Subject (vide para 2.01), and must remit, within due time, the prescribed Test Fees to the University of Allahabad in the manner described in para 3.05.

3.02 The On-line Application / Registration Form for CRET-2019 shall be accessible only during the dates specified in the Schedule (vide para 3.05) at www.aupravesh2019.com OR Admission-2019 link of www.allduniv.ac.in

The candidate has to **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 - 2019, the candidate is strongly advised to carry out the following tasks for his/her own convenience:

3.03.1. Take a Print-out of this Bulletin (Information and Guidelines) and read it carefully.

3.03.2. Take a Print-out of the CRET-2019 Syllabus of the Subject in which he / she desires, and is eligible, to appear.

3.03.3 Read thoroughly the Instructions for the filling and submission of the Online Form.

3.03.4. 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 Get his/her latest Passport-size Color Photograph and his signature scanned by Computer, so that the scanned Photograph and Signature can be submitted with the On-line Form. The original of the scanned Photograph should be carefully preserved for submission to the CRET-2019 Committee.

3.03.6 Though it is not mandatory, it is advised that if the candidate does not already have an e-mail address (e-mail ID), he/she should create for himself/herself a valid email ID, in order

that the CRET-2019 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-2019. The candidate is also prohibited from" submitting more: than" one On-line Application / Registration Form for CRET-2019. In case the candidate submits more than one On-line Form, all the Forms submitted by him shall stand cancelled.

3.05 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-2019.

NOTE : There is no provision for the withdrawal by a candidate of his / her application / candidature for CRET-2019 once he / she has submitted the 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 present 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 eligible candidates (including JRFs / CSIR qualified candidates) shall contact the concerned Department/Centre/Institute for further instructions and final selection for admission to its Ph.D. Programme.

4.02 A Certificate of Eligibility issued by the Director, CRET-2019 to the eligible candidates, shall be sent together with the list of eligible candidates to the concerned Department for distribution to the students. This will support the eligibility of the candidate for admission to Ph.D. Programme of the concerned/allied subject and shall be submitted in original with the prescribed Application Form for admission to Ph.D. of the University to be filled and submitted for Level 2 (Interview) to the concerned DPC.

4.03 The candidate may inspect their answer sheets for a token payment of Rs. 100/- each after one week of the declaration of results and before one month of the declaration of result.

SECTION 5

LEVEL 2 (INTERVIEW)

5.01 Candidates found eligible for Level-2 (Interview) shall be required to contact the concerned/allied Departments/Centre/institute. They shall fill the form prescribed by the

University of Allahabad, for admission to its Ph.D. Programme and appear before the DPC of the subject for interview and other formalities as desired by the concerned DPC. Their admission shall be finalized by concerned DPC depending on the availability of seats and supervisors.

5.02 A candidate desirous of pursuing inter-disciplinary research shall be permitted to apply for CRET 2019 in anyone of the allied subjects for whom the Certificate of Eligibility shall have to be submitted in original with the prescribed application form.

SECTION 6

IMPORTANT INSTRUCTIONS TO THE CANDIDATES

6.01 Every candidate MUST CARRY HIS/HER ADMIT CARD for being permitted to appear at the concerned test(s) of CRET-2019.

6.02 Every candidate must sit on his/her seat as per the roll number allotted.

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

6.04 No candidate will be allowed to leave the Examination Hall till the end of the Test.

6.05 Calculators/Mobile Phones/Pagers etc. shall not be allowed within the premises of the examination centre.

6.06 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.

6.07 Eligible candidates in Level 1 are required to collect Eligibility Certificate from the concerned department / centre/institute. The certificate has to be submitted in original along with the prescribed Application/Registration form for Level 2 (Interview).

———

For the convenience of the online application
Help Desk has been setup
Toll free number – 18001805643
Tolled number – 9453827208
Helpdesk email ID : helpdesk.aupravesh2019@gmail.com

Email : helpdesk.aupravesh2019@gmail.com
Helpdesk Number : Tolled No. : +91 9453827208
Tollfree No. : 18001805643

Note : Call centre timing – 10:00 AM to 07:00 PM (All Days)

AGRICULTURAL-BOTANY

- Historical, symptomology, properties and nature of plant viruses, modes of transmission of plant viruses, serology and mutations in plant viruses. General principal of control of virus diseases in plants. A knowledge of the common virus diseases of potato, tobacco, Hibiscus crcurbits, beans and banana.
- A knowledge of more important bacterial diseases with special reference to crown gall, citus canker, fire blight of pear, sugarcane stripe and bacterial wilt of crops.
- History of Mycology, Taxonomy and nomenclature of fungi Origin of phylogeny of fungi. Different systems of classification and their basis. Physiology of fungi, structure and life history of the chief representatives of fungi.
- Cell division: Mitosis and meiosis, chromosomal aberrations, use of chromosomal aberration in genetical studies. Morphology and chemistry of the chromosome.
- Polyploidy: Nature and classification of polyploidy cytology and genetics of polyploids.
- Heredity and environment, laws of heredity. Linkage'crossing over and mapping of chromosomes. The nature of the gene. Physical structure of the gene, interaction penetrance and expressivity, position effect, pleiotropism, allelism multiple alleles and pseude alleles.
- Gene in population, quantitative inheritance and cytoplasmic inheritance.
- Determination of sex, evolution of sex in flowing plants.
- Mutation: Nature and cause, factors affecting mutation. Genetics of sterility and incompatibility. Genetics of species and race formation.
- History of plant breeding, its present status and scope. Mode of reproduction in crop plants. Heretosis and its application.
- Plant introduction and its utility in crop improvement General methods of crop improvement.
- Regional soils of India in relation to crops and their production.
- Characteristics of root systems. Drought resistance, chemical control of water relations.
- Concept of water requirement of crops and the critical period of water requirement of plants and its significance in crop production.
- Formation of usar soils and types of usar. Control of alkalinity and salinity.
- Growth, methods of growth analysis, control of growth by hormones, mechanism of action of growth regulators, control of differentiation, flowering, dormance and senescence.
- Physiology of flowering, photoperiodism and vernalization.
- Origin, history, breeding and production technology of important fruits such as mango, banana, citrus, guava, papaya, grape, pineapple, litchi, pomegranate, ber, apple, pear, and walnut with special reference to climate, soil, propagation, cultivars, nutrition, irrigation and other orchard management practices.
- Origin, history, breeding and production of important vegetables, spices and condiments like tomato, brinjal, chillies, radish, turnip, carrot, beans, peas, onion, potato, okra, cucurbits,

coriander, garlic, etc. with special reference to climate, soil, seed production including development of hybrids, cultivars, nutrition, irrigation and other management practices.

- History of gardening in India. Styles of gardening, their principles and practices with special reference to Nunghal, Japanese and English gardens. Garden parts (features), their materials and methods of development including garden ornaments. Classification and utilization of ornamental trees, shrubs, climbers, herbaceous, perennials, annuals and foliage plants. Preparation and management Bonsai. Home gardens. Production of important flower crops like orchids, marigold, chrysanthemum, rose, jasmine, dahlia, with reference to climate, soil, propagation, cultivars, planting methods, nutrition, irrigation etc. Prolonging, storage and vase life of cut flowers and their utilization.
- A study of the botany of important weeds associated with the crops plants of the region. Methods of preventing introduction and spread of weeds. Principles and procedures of weed control.
- Concept of crop ecology and its scope in agronomic pursuits. Plant succession, units of vegetation competition and invasion, reaction and stabilization, factors of habitat and development.
- Light – a factor in geographical distribution, heating, chemical, quantitative and qualitative effects. Latitude and length of day photocritical periods, photoperiodism and plant adaptations. Utilization of artificial light.
- Soil microorganisms and their role in production. Principles and practices of dry farming; special problems in dryrming Mixed-cropping and strip cropping in agriculture in India. Agronomic practices in relation to soil acidity and alkalinity.
- Floral biology, mode of reproduction, sporogenesis, pollination, fertilization, embryogenesis, fruit and seed development. Apomixis, parthenocarpy, polydembryony and somatic embryoids. Seed structure of monocot and dicot. Chemical composition of seeds. Seed dormancy – types, causes, mechanisms in induction and release, factors affecting, methods to over come, dormancy, and significance in agriculture.
- Principles of seed processing. Seed drying- principles and methods. Pre-cleaning, grading, treating and packaging.
- Need for storage. Storage behaviour of orthodox. Factors affecting seed storage and role of moisture, temperature, RH. and moisture equilibrium. Storage structure. Methods of stacking and their impact. Germplasm storage.
- Detailed study of photosynthesis and role of carbon assimilation in crop production.
- Respiration, respiratory substrates, factors affecting respiration, aerobic and alcoholic fermentation and their interrelationships, metabolisms of organic acids.
- Metabolism of fats.
- Physiological basis of purnning, lodging unfruitfulness and yield. Factors affecting: root ratio.
- Special physiological problems connected with crops like sugarcane, cotton, hemp, wheat, tobacco, rice, groundnut etc.

- Frequency distribution, mean, medium and mode, standard, normal and binomial distribution. Correlation- partial and multiple regression, coefficient. Tests of significance- t, f and chi – squaretests.
- Chromosomal crossing over, linkage maps, double crossing over coincidence and interference; test crosses, evidence that crossing over is associated with chromosomal exchange factors affecting crossing over polyploids, and inversions. Male dresophila crossing by breakage of chaismata chaismata terminalizatiion, multiple allelism, pseudoallels, position, mutation rates, mutator genes, radiation and chemical-induced mutations. Mechanism of induction of chromosomal structural changes paramutation.
- Structure and replication of DNA and RNA, DNA theory as the classical basis of heredity. Recombination in microorganisms structure of gene. Molecular aspects of chromosome structure. Molecular aspects of mutation and recombi Genetic code and genetic control of protein synthesis. Control of differentiation.
- Breeding for disease and pest resistance, host parasite relationship, concept of horizontal and vertical resistance. Polypoloidy in plant breeding, breeding behaviour of aneuploids, autopolyploids, allopolyplnids and role in induced polyploids, Macro- and micromutations and plant breeding. Breeding for drought resistance, lodging resistance, drarfing genes plant type rainfed conditions saline resistance and coln resistance. Release of new varieties, multiplication and distribution, seed certification, seed labeling and testing maintenance of pure seed stocks. Statistical methods and experimental designs for plant breeding experiments. Cytogenetics and improvement work done in India on wheat, rice sugarcane, cotton, potato and mustard. Frequency distribution, mean, medium and made. Tests of significance-t, f and chi-square tests. Experimental designs, basic principles. Completely Randomized, Randomized block. Latin square, split plot.
- Black tip of mango, chlorosis and sun scald.
- Physiology of penetration and infection in fungi Pathogen factors in the physiology of disease-toxins, enzymes and other metabolies Factors governing resistance and suscrptibility of the host of disease.
- Influence of environmental factors on plant diseases Epiphyhtotics and conditions necessary for its establishment. Physilogical specialization in parasitic fungi. Forecasting of plant disease.
- A detailed study of important bacterial, viral, mycoplasma and fungoid diseases of wheat barley; oat rice, pea, gram, maize, jowar, bajara potato, tobacco, colocasia, chilli, brassica and alied plants, groundnut, linseed, cotton sugarcane, mango guava, papaya, apple, peach, pear, cucurbits and banana.
- A study of the economically important flowering parasites.
- Orobanche, Cuscuta, Striga, Loranthus and Biscum.
- Important Nematode diseases of plants.
- Quarantines and prohibitions; general idia of quarantine regulations in force in India and Uttar Pradesh.
- Crop rotation, field sanitation, eliminations of alternate hosts; chemical eradication.

AGRICULTURAL-CHEMISTRY

Elements in soil and plants
Periodic Classification of elements: electronic configuration, Valency; Oxidation and reduction; ionic equations; essential plant elements (nutrients),Fee redical; 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,I,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, 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 aspeets 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-red spectroscopy, Radio-tracer technique principle, methodology, labeling and assay of isotopes.

Application of physical chemistry of soils
Theory of dilute solutions: Osmosis, Colloidal State, soil as a colloid. Properties of colloids, colloical behaviour 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 of soil.
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, soil cartography. Soil crosion, factors affecting crosion. Methods of controlling soils erosion, soil conservation.

Soil classification, Detailed study of various classification, 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 sulphur oxidizins, 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 green algae. 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

A. Basic concepts and use of:
B. Insecticides - Chlorinated hydrocarbons, organic phosphours compounds: Biological insecticides, Carbamates Arsenics, cluorides etc.
C. Herbicides - Phenoxy compounds, Fluorosilicates substituted ureas.
D. Fungicides - Heavy metal compounds, glyoxyledine compounds, guanidines.
E. Rodenticides - General eyanides, phosphides, strychaine barium carbonate.
F. Nematocides - Carbamates and others.
G. Fumigants- Diethylene dichloride and dibromide

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 eveolution 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 there 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.

ANCIENT HISTORY

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, Rna Sanskaras, Purusharthas, Agraharas, Kara/Vishti, Arthasastra Saptanga, Stupa, Chaitya, Nagar, Dravida, Vesara Mathura/Gandhara Schools of Art.

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 Vallabhi sanskrit literature.
Gurjara–Pratiharas, Kalachuin–Chedis, Paramaras
Arab Contacts – Ghaznavi Conquest, Alberuni
Palas and Senas
Pallavas and Chalukyas of Badami
Chalukyas of Kalyana and Cholas Administration and local government, Society, Economy and Culture during the Early – Medieval Period: Feudalism, trade guilds, position of women, educational institutions – Nalanda, Vikramashila; growth of Vaishnavism and Saivism; art and architecture.
Research in Ancient History

Scope and value of History: Objectivity and bias in history; history and its auxiliary branches; area of research proposed. Sources – Primary/Secondary in the proposed area of research.
Modern Historical writing in the proposed area of research.

Area Specific : 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.

(a) Society and Economy in the Gupta Period, Varnashram system, Caste System, Slavary, Sanskaras, Purusharthas, Position of women, Education.

(b) Agriculture, Industry and Industrial guilds and labour.

(c) Trade and commerce, Mercantile guilds, Taxation and Revenue system, Rural and urban settlements.

(d) Feudal system, Social and Economic changes during early medieval period.

(e) Transition from Antiquity to the early middle Ages, Feudalism social and economic changes during the early medieval period.

Area Specific : Section B
(Ancient India Art & Architecture)

(a) Historiography, Approaches and Sources, Research Methodology in Ancient Indian Art & Architecture, the meaning of Art: Study of content of Art.
(b) Interplay of Regions, Artists and Patron, Margi and Desi Arts, Representing gender, Rituals.
(c) Evolution and History of Architecture; Harappan, Mauryan, Rock–cut Architecture, Stupa Architecture, Temple Architecture: Gupta temples, Orissa, Khajuraho, Chalukyas, Rarstrukutas, Pallario, Cholas.
(d) Indian and Western Aesthetics.
(e) Sculptural Art of the Mauryas, Shungas, Satanahanas, Kushanas, Guptas, Chandelas, ... Orissa, Pallava and Chola.
(f) Origin and Development of Indian Iconography: Bodhisattva, Buddha, Adinath, Paraswanath, Mahavira, Vishnu, Shiva, Shakti, Surya,
(g) Terracotta Art, Indus, Mauryan, Shunga, Kushana, Gupta, early medieval Regional traditions.
(h) Paintings: Pre–Historic, Classical Painting traditions, Ajanta and Bagh.

Area Specific : Section C
(Ancient Indian Religion and Philosophy)

(a) Sources,
(b) Foundations of Religious systems: Harappan, Vedic and Sangam.
(c) Sun Worship, Saivism, Vaishnavism, Janinism and Buddhism.
(d) Rituals, Yajna, Educational rites, Puranic Anuthana, Tirtha, Dana, Shraddha.
(e) Philosophy of the Upanishads, Jain Philosophy, Buddhist Philosophy, Philosophy of Sankara and Gita.
(f) Shaktism, Tantricism, Ascetic tradition and Bhabti.
(g) Shankaracharya, Ramanujam and Lobayat.

Area Specific : Section D
(Archaeological Studies)

(a) Hunting and gathering – Paleolithic and Mesolithic in India.
(b) Beginning of Agriculture – Neolithic and Chalcolthic in India.
(c) Indus valley Civilization origin, extent, date, characteristics, decline, survival.
(d) Antiquity of Iron, second urbanizations iron and megaliths.
(e) Archaeological Methods and Techniques: Exploration, excavations and conservation of artifacts; dating techniques; importance of stratigraphy in archaeology.

ANTHROPOLOGY

1. Social-Cultural Anthropology

(i) 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 Proscriptive forms.

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

(ii) Anthropological Thoughts:

Unit 1 **Anthropological notion of Culture:** Society, Culture and Civilization

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 American Schools

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

(iii) Research Methods:

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; Statistical Methods.**

2. 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 and crossing-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.

Unit 6 **Population Genetics:** Hardy Weinberg Law, Genetic polymorphism,Inbreeding and Genetic Load.

Unit 7 **Applications of Human Genetics:** Genetic Screening, Genetic Counseling and Genetic Engineering.

Unit 8 **Applied Physical Anthropology**: (i) Anthropology of Sports, (ii) Nutritional Anthropology, (iii) forensic Anthropology.

Unit 9 **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

Unit 13 **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 and Racism

Unit 15 **Population Variation in Qualitative Traits:** Hb and its Variants, G6PD, Transferin, ABH Secretion and Lewis Antigen, Histocompatibility, Antigen and Thalassaemia

Unit 16 **Genetics of Blood Group:** Genetic markers- ABO, MNSs and Rh 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

Unit17 **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

3. 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, thermo luminescence dating, Pollen dating, Varve analysis, Uranium dating, Potassium-argon method, Fluorine dating, C-14 Amino Acid 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 Salient features

.

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 – first cities in the Ganga valley and emergence of the Mauryan Empire

4. 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 Joint Family.

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.**

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 الجونفوری
(٣) سید غلام علی آزاد البلغرامی
(٤) شاه ولی الله الدهلوی
(٥) عبد الحی الحسنی
(٦)سید ابو الحسن علی الندوی

(ب) الشعر

(١) فضل حق الخیرآبادی
(٢) فیض الحسن السهارنفوری
(٣) انور شاه الکشمیری
(٤)نواب صدیق حسن خاں
(٥) ذو الفقار علی الدیوبندی
(٦)شاه ولی الله الدهلوی

الأعمال الهامة فی الأدب العربی ـ الهندی — Important Works of Indo-Arabic Literature

(١)تحفة المجاهدین
(٢) سبحة المرجان
(٣) نزهة الخواطر
(٤) رجال والهند السند
(٥) رجال الفکر و الدعوة
(٦) ماذا خسر العالم بانحطاط المسلمین

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

اللغة العربية و الادب العربى الحديث: (دراسة الشعراءو والأدباء 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

اهم المراجع : Major Reference Works:

(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

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

(١)التفسيرالكبير

(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
احمد امين	(١)فجر الاسلام
احمد امين	(٢) ضحى الاسلام
احمد امين	(٣) ظهر الاسلام
عبد الحى	(٤) الثقافة الاسلامية فى الهند
جرجى زيدان	(٥)تاريخ التمدن الاسلامى

: Literary Genres, Movements and Institutions :

لأجناس الأدبية و الحركات و المؤسسات

(١) كتب فى السيرة النبوية

(٢) الموشحات

(٣) الحركة الرمزية

(٤) ادب المهجر

(٥) الرابطة القلمية

(٦) العصبة الاندلسية

(٧) مدرسة الديوان

(٨) حركة ابولو

علم البلاغة و العروض:	: Rhetoric and Prosody:
(١) البحر الطويل	
(٢) البحر الكامل	
(٣) الفصاحة	
(٤) البلاغة	
(٥) علم المعانى	
(٦) علم البيان	
(٧) علم البديع	
مبادئ النقد الأدبى	: Principles of Literary Criticism:
(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

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

BEHAVIOURAL AND COGNITIVE SCIENCES

General Issues and Foundations of Cognitive Science
Information processing approach, Marr's levels of processing, Represent ations,Dynamical approaches, Situated and Embodied cognition, Modularity, Culture and Cognition, Cognitive Development, Different methodologies used in Cognitive science, Reaction Time measurement and analysis, Signal detection theory, Eye tracking

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 to Regression

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 with other disciplines, Levels of linguistic analysis: Phonology-phonetics, syntax, semantics, morphology, pragmatics, Word Recognition, Sentence processing, Language Acquisition, Bilingualism, Language-Vision interaction

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.

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.

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.

Email : helpdesk.aupravesh2019@gmail.com
Helpdesk Number : Tolled No. : +91 9453827208
Tollfree No. : 18001805643

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).

BIOTECHNOLOGY

1. MOLECULES AND THEIR INTERACTION RELAVENT TO BIOLOGY

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

2. CELLULAR ORGANIZATION

A. **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.
B. **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.
C. **Organization of genes and chromosomes:** Operon, interrupted genes, gene families, structure of chromatin and chromosomes, unique and repetitive DNA, heterochromatin, euchromatin, transposons.
D. **Cell division and cell cycle:** Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.
E. **Microbial Physiology:** Growth, yield and characteristics, strategies of cell division, stress response.

3. FUNDAMENTAL PROCESSES

A. **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.
B. **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.
C. **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.

D. 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.

4. CELL COMMUNICATION AND CELL SIGNALING

A. 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.

B. 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.

C. 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.

D. 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.

E. 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.

5. DEVELOPMENT BIOLOGY

A. 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.

B. 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.

C. 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.

D. 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*.

E. Programmed cell death, aging and senescence.

6. SYSTEM PHYSIOLOGY – PLANT

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

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

C. Nitrogen metabolism: Nitrate and ammonium assimilation; amino acid biosynthesis.

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

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

F. 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.

G. Secondary metabolites: Biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.

H. 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.

7. SYSTEM PHYSIOLOGY – ANIMAL

A. Blood and circulation: Blood corpuscles, haemopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostatis.

B. 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.

C. Respiratory system: Comparison of respiration in different species, anatomical considerations, transport of gases, exchange of gases, waste elimination, neural and chemical regulation of respiration.

D. 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.

E. Sense organs: Vision, hearing and tactile response.

F. 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.

G. Thermoregulation: Comfort zone, body temperature – physical, chemical, neural regulation, acclimatization.

H. Stress and adaptation.

I. Digestive system: Digestion, absorption, energy balance, BMR.

J. Endocrinology and reproduction: Endocrine glands, basic mechanism of hormone action, hormones and diseases; reproductive processes, neuroendocrine regulation.

8. INHERITANCE BIOLOGY

A. Mendelian Principles: Dominance, segregation, independent assortment, deviation from Mendelian inheritance.

B. Concept of gene: Allele, multiple alleles, pseudoallele, complementation tests.

C. 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.

D. Gene mapping methods: Linkage maps, tetrad analysis, mapping with molecular markers, mapping by using somatic cell hybrids, development of mapping population in plants.

E. Extra chromosomal Inheritance: Inheritance of mitochondrial and chloroplast genes, maternal inheritance.

F. Microbial genetics: Methods of genetic transfers – transformation, conjugation, transduction and sex–duction, mapping genes by interrupted mating, fine structure analysis of genes.

G. Human genetics: Pedigree analysis lod score for linkage testing, karyotypes, genetic disorders.

H. Quantitative genetics: Polygenic inheritance, heritability and its measurements, QTL mapping.

I. Mutation: Types, causes and detection, mutant types – lethan, conditional, biochemical, loss of function, gain of function, germinal implications.

J. Structural and numerical alterations of chromosomes: Deletion, duplication, inversion, translocation, ploidy and their genetic implications.

K. Recombination: Homologous and non–homologous recombination, including transposition, site–specific recombination.

9. DIVERSITY OF LIFE FORMS

A. Principles and methods of taxonomy: Concepts of species and hierarchical taxa, biological nomenclature, classical and quantitative methods of taxonomy of plants, animals and microorganisms.

B. Levels of structural organization: Unicellular, colonial and mutlicellcular forms; levels of organization of tissues, organs and systems; comparative anatomy.

C. 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.

D. 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.

E. Organisms of health and agricultural Importance: Common parasites and pathogens of humans, domestic animals and crops.

10. ECOLOGICAL PRINCIPLES

A. The Environment: Physical environment; biotic environment; biotic and abiotic interactions.

B. Habitat and niche: Concept of habitat and niche; niche width and overlap; fundamental and realized niche; resource portioning; character displacement.

C. 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.

D. **Species Interactions:** Type of interactions, interspecific competition, herbivory, camivory, pollination, symbiosis.

E. **Community ecology:** Nature of communities; community structure and attributes; levels of species diversity and its measurement; edges and ecotones.

F. **Ecological succession:** Types; mechanisms; changes involved in succession; concept of climax.

G. **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).

H. **Biogeography:** Major terrestrial biomes; theory of island biogeography; biogeographical zones of India.

I. **Applied ecology:** Environmental pollution; global environmental change; biodiversity–status, monitoring and documentation; major drives of biodiversity change; biodiversity management approaches.

J. **Conservation biology:** Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).

11. EVOLUTION AND BEHAVIOUR

A. **Emergence and evolutionary thoughts:** Lamarck; Darwin–concepts of variation, adaptation, struggle, fitness and natural selection; Mendelism; spontaneity of mutations; the evolutionary synthesis.

B. **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.

C. **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.

D. **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.

E. **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.

F. **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.

12. APPLIED BIOLOGY:

A. Microbial fermentation and production of small and macro molecules.

B. Application of immunological principles (vaccines, diagnostics), tissue and cell culture methods for plants and animals.
C. Transgenic animals and plants, molecular approaches to diagnosis and strain identification.
D. Genomics and its application to health and agriculture, including gene therapy.
E. Bioresource and uses of biodiversity.
F. Breeding in plants and animals, including marker – assisted selection.
G. Bioremediation and phytoremediation.
H. Biosensors.

13. METHODS IN BIOLOGY

A. **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.

B. **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.

C. **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.

D. **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.

E. **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.

F. **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.

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

H. **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.

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

BOTANY

1. MOLECULES AND THEIR INTERACTION RELABENT TO BIOLOGY

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

2. CELLULAR ORGANIZATION

A. **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.
B. **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.
C. **Organization of genes and chromosomes:** Operon, interrupted genes, gene families, structure of chromatin and chromosomes, unique and repetitive DNA, heterochromatin, euchromatin, transposons.
D. **Cell division and cell cycle:** Mitosis and meiosis, their regulation, steps in cell cycle, and control of cell cycle.
E. **Microbial Physiology**: Growth, yield and characteristics, strategies of cell division, stress response.

3. FUNDAMENTAL PROCESSES

A. **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.
B. **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.
C. **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.
D. **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.

4. CELL COMMUNICATION AND CELL SIGNALING

A. **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.

B. **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-medidated 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.

5. DEVELOPMENTAL BIOLOGY

A. **Basic concepts of developmen**t: 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.

B. **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.

C. **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**.

D. **Programmed cell death, aging and senescence.**

6. SYSTEM PHYSIOLOGY PLANT

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

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

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

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

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

F. 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.

G. **Secondary metabolites:** biosynthesis of terpenes, phenols and nitrogenous compounds and their roles.

H. **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.

7. INHERITANCE BIOLOGY

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

8. DIVERSITY OF LIFE FORMS

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

9. ECOLOGICAL PRINCIPLES

A. **The environment**: Physical environment, biotic environment, biotic and abiotic interactions.
B. Habitat **and niche :** Concept of habitat and niche, niche width and overlap, fundamental and realized niche, resource partitioning, character displacement.
C. **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.
D. **Species interactions** : Types of interactions, interspecific competition, herbivory, carnvory, pollination, symbiosis.
E. **Community ecology** : Nature of communities, community structure and attributes, levels of species diversity and its measurement, edges and ecotones.
F. **Ecological** succession : Types, mechanisms, changes involved in succession, concept of climax.

G. **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).
H. Biogeography **:** Major terrestrial biomes, theory of island biogeography, biogeographical zones of India.
I. **Applied ecology**: Environmental pollution, global environmental change, biodiversity-status, monitoring and documentation, major drivers of biodiversity change, biodiversity management approaches.
J. **Conservation biology :** Principles of conservation, major approaches to management, Indian case studies on conservation/management strategy (Project Tiger, Biosphere reserves).

10. EVOLUTION AND BEHAVIOUR

A. **Emergence of evolutionary thoughts:** Lamarck, Darwin-concepts of variation, adaptation, struggle, fitness and natural selection, Mendelism, spontaneity of mutations, the evolutionary synthesis.
B. **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.
C. **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.
D. **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.
E. **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.

11. APPLIED BIOLOGY

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

12. METHODS IN BIOLOGY

A. **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.

B. **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.

C. **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.

D. **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.

E. **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.

F. **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.

G. **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.

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

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.

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 situations; Preface competition, Monopolistic competition, Monopoly, Price discrimination and Oligopoly, Pricing strategies.

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

PAPER-III (B)
[ELECTIVE /OPTIONAL]

Elective – I: 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

Elective – II : 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

Elective – III : 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

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.

DEFENCE & STRATEGIC STUDIES

1. Defence of National Security with Reference to the Contemporary Thinking.
2. Defence, Foreign, Security and Domestic Policies; Concept, Formulation, Objectives and Linkages.
3. Military Alliances and Pacts, Peace Treaties, Defence Cooperation, Strategic Partnership and Security Dialougue.
4. Environmental Security.
5. Armaments: Arms Race, Arms Aid, Arms Trade and Small Arms proliferation.
6. Problem of System of Governance and Human Rights.
7. Proliferation of Weapons of Mass Destruction (WMD) and NPT, CTBT, MTCR, NMD, and FMCT.
8. Military – Indutrial Complex
9. Military, Neuclear and Missile Capabilities of China, Pakistan and India.
10. End of Cold War and Mergence of New World Order, New Trends after Sept., 9/11, 2001.
11. Development of Central Asian Republics.
12. Confidential Building Measures: Concept, Kinds and Utility,
13. Civil Defence
14. Civil-Military Relations.
15. India's Relation with USA, Russia, China, Pakistan, Israel, European Union, Central Asia.
16. Conceptual Analysis of Conflict and Peace.
17. Nature and Forms of Conflict.
18. Conflict Management and Conflict Resolution.
19. Insurgency and Terrorism in South Asia.
20. An Evaluation of the Existence, Importance and Future of Guerilla Warfare in theNuclear Age.
21. Terrorism and Human Right Issues.
22. Defence Policy of India: 1947-1971.
23. Defence Policy in India: 1971 onwards.
24. Higher Defence Organisation in India.
    (a) 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.
25. Strategic Thought of India.
26. Internal Threats of India's Security: Socio, Economic, Political, Science & Technological, Military and Allied Aspects.
27. Security Problems in the North Eastern Region of India.
28. Counter Terrorist Strategy of India.
29. Future Trends and Prospects of Security in the Region.
30. Indian Ocean as a Zone of Peace.
31. Development of New marine Technologies.
32. Maritime Strategy of India.

UNIVERSITY OF ALLAHABAD
CRET 2019

Email : helpdesk.aupravesh2019@gmail.com
Helpdesk Number : Tolled No. : +91 9453827208
Tollfree No. : 18001805643

DESIGN AND INNOVATION IN RURAL TECHNOLOGY

ELIGIBILITY:

The eligibility will be M.Sc. in Rural Technology and Development or allied branches (Botany, Microbiology, Agriculture Botany, Fisheries etc.) with their proven experience in Rural Technology and Development as per regulation of University of Allahabad.

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.

DEVELOPMENTAL 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.

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

Sectoral Aspects of Development

a. Role of Agriculture in Economic Development
b. Efficiency and Productivity in Agriculture
c. New Technology and Sustainable Agriculture
d. Globalization and Agriculture Growth
e. Rationale and Pattern of Industrialization in developing countries

Democracy and Development

a. Colonialism, Neo-colonialism and Post-colonial State
b. Decision Making, Planning and Policies for Development in Westminster and Presidential Forms
c. Democracy, Dissent and Development

Political Modernization and Development

a. Colonial and Post-colonial Development and Modernization

Politics and Economics of Development in India

a. Mixed v/s Open Economy
b. Aim and Objectives of Five Year Plan

c. Democratic Decentralization / Panchayati Raj and Development
d. Good Governance

Basic Concepts of Region
a. Meaning, Definition and Concept
b. Changing Concepts of the Region from an Inter-disciplinary viewpoint
c. Types of Regions : Formal and Functional, Uniform and Nodal, Single Purpose and Composite Region, Special Purpose Regions
d. Concept of Space, Area and Locational Attributes

Theories of Regional Development
a. Spatial Organization and Integration
b. Theories of Polarized Development
c. Theories of Regional Underdevelopment
d. Theories of Sustainable Development

Introducing Planning
a. Planning Process: Sectoral, Temporal and Spatial Dimensions
b. Short-term and Long-term Perspectives of Planning
c. Regional Development and Multi-regional Planning in a National Context
d. Indicators of Development and their Data Sources
e. Measuring Levels of Regional Development and Disparities

Multi-level and Decentralized Planning
a. Concept of Multi-level planning
b. Decentralized Planning: Sectroal v/s Decentralized; Top-down v/s Bottom-up Planning

Regional Development, Planning and Practices in India
a. Five Year Plans
b. Macro-Meso-Micro Planning in India
c. Target area and Target Group Approach
d. Regional Social Movements and their Linkages with Regional Policy and Regional Development Strategies

Introduction to Human Development
a. Choice, Functioning and Capabilities
b. Approaches: Capability, Commodity based System and Utility Approach, Quality of Life, Basic Needs Approach, Rawlsian Approach
c. Linkages between Human Rights and Human Development: Right lo Development
d. Millennium Development Goals (MDGs): Understanding MDGs, Linkages between Human Development and MDGs

Measuring and Reporting on Human Development
a. Emergence of HDI: HDI as compared to per capita GDP, Methods of Computing HDI, Critique of HDI

b. Other Indices: HPI, GRDI, GEI, Using Indices for Policy Purpose, Experiences of HDI and Inter-state Comparison in India

Application of Human Development

a. People's Participation and Action: Forms of Participation (Economic, Sociocultural, Political), Exclusion: Forms and Types (Poor, Women, Minorities and Indigenous)
b. Obstacles to Participation (Legal Systems, Bureaucratic Constraints, Social Norms)
c. PRA and PLA
d. Social Movements; Civil Society, NGOs and CBOs
e. Role of INGOs / Donor Agencies

Governance and Human Development

a. Defining Governance
b. Understanding Governance: Economic, Political and Civil
c. Emerging Issues in Governance
d. Actors in Governance: State, Tiers of Governance
e. Elements in Governance: Institutions, Delivery Mechanisms, Laws, Rules and Procedure.
f. Linkages between Governance and Human Development: Political Freedom, Participation, Decentralization, Empowerment, Equity and Efficiency, Accountability, Right to Information

Globalization and Human Development

a. Implication for Growth
b. Employment, Inequality and Poverty
c. Gender Issues
d. Livelihoods and Rights
e. Health, Education, Environment and Human Security

Basic Concepts

a. Inequality–Natural Differences and Social Inequality; Structuring of Inequality, Social Differentiation, Hierarchy, Social Stratification
b. Poverty - Definitions of Poverty: Epistemological and Theoretical Issues concerning the conceptualization of deprivation, exclusion, marginalization and poverty;
c. Development - Growth, Evolution, Progress, Modernization, Sustainable Development

Form of Social Inequality

a. 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

a. Absolute and Relative Poverty
b. Poverty Eradication/Reduction Programmes
c. 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

a. Industrialization and Development
b. Agriculture and Structural Inequality
c. Economic Growth, Gender, Education and Health
d. North-South Divide and South-South Cooperation
e. Share in Global Trade and GDP
f. Democracy and Development Case Studies of India, China, Brazil, Venezuela, South Africa, Mali

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.

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 (a) Decision making (b) Organizational Compliance (c) Organizational Development (d) PERT (e) 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.

ENGLISH

The Course for English will include the following topics:

1. Chaucer to Shakespeare
2. Jacobean and Restoration Periods
3. Augustan Age: 18th Century literature
4. Romantic Period
5. Victorian Period
6. Modern Period
7. Contemporary Period
8. American and Other Non-British Literatures
9. Literary Theory and Criticism
10. Rhetoric and Prosody.

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, 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 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, O3 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 Nature 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).

FOOD TECHNOLOGY

Principles of Food Processing

Introduction of Food Technology - definition, scope and opportunities. Causes of food spoilage, sources of microbial contamination of foods, food borne 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/ultra filtration, 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 enzyme, enzyme activity in different food systems, commercial availability, Immobilization of enzymes, flavor 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, 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.

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.

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.

Geology/Applied Geology/Geo-Physics (EARTH AND PLANETARY SCIENCE)

GENERAL EARTH SCIENCES:

1. 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.

2 A. 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

2 B. 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

3. 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.

4. 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.

GEOLOGY:

1) 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.

2) 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.

3) 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.

4) 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.

5) 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.

6) 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.

7) 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.

8) 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.

9) 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.

10) (I)APPLIED GEOLOGY:

(i) **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.

(ii) **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.

(iii) **Mineral Exploration:** Geological, geophysical, geochemical and geobotanical methods of surface and sub-surface exploration on different scales. Sampling, assaying and evaluation of mineral deposits.

(iv) **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:

1) 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.

2) 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.

3) 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.

4) 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.

5) 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.

6) 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.

7) 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.

8) 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.

9) 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.

10) 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.

HINDI

हिन्दी (पाठ्यक्रम)

1. हिन्दी भाशा और साहित्य और इतिहास

(क) हिन्दी भाशा का इतिहास

1. अपभ्रंश अवहट्ट पुरानी हिन्दी का स्वरुप और भाषिक विशेषताएँ।
2. आधुनिक आर्यभाषाओं में हिन्दी का स्थान
3. हिन्दी की उपभाषाएँ– राजस्थानी, पहाड़ीए पश्चिमी हिन्दी, पूर्वी हिन्दी, आदि का संक्षिप्त परिचय।
4. हिन्दी प्रमुख बोलियाँ– अवधी, ब्रज, खड़ीबोली, भाषिक, परिचय एवं काव्यभाषा के रुप में।
5. हिन्दी के विविध रुप– संपर्क भाषा, राजभाषा, राष्ट्र भाषा
6. देवनागरी लिपि, इतिहास एवं विशेषताएँ
7. कम्प्यूटर और हिन्दी

विकास

(ख) साहित्य का इतिहास :

1. प्रमुख साहित्येतिहासकारों की इतिहास दृष्टि
2. काल के विभाजन का आधार
3. आदिकालीन हिन्दी साहित्य की सांस्कृतिक प्रवृतियाँ, लौकिक एवं धार्मिक काव्य
4. भक्ति काल– भक्ति आन्दोलन का समाजशास्त्रीय आधार
5. निर्गुण एवं सगुण भक्तिः काव्य साम्य–वैषम्य
6. निर्गुण काव्य– सन्त काव्य, सूफी प्रेमाख्याानक काव्य– विशेषताएँ एवं सांस्कृतिक प्रदेय, सगुण भक्ति काव्य, राम भक्ति काव्य, कृष्ण भक्ति काव्य, भक्ति काव्य और सामाजिक समन्वय भक्ति काव्य और लोकभाषा
7. आधुनिक काल– आधुनिकता का तात्पर्य, भारतेन्दु युग, द्विवेदी युग, छायावाद, छायावादोत्तर, प्रगतिवाद, प्रयोगवाद, नई कविता आदि की साहित्यिक प्रवृतियाँ एवं उपलब्धियाँ।
8. रीतिकाव्य– रितिबद्ध, रितिसिद्ध एवं रीति युक्त काव्य, रीतिकालीन सर्जनात्मक परिवेश, रीतिकाव्य की उपलब्धियाँ एवं सीमाएँ।रीतिकालीन विविध काव्य प्रवृत्तियाँ।
9. गद्य की विधाओं का विकास– निबंध, कहानी, उपन्यास, नाटक, आलोचना, संस्मरण, आत्मकथा आदि।

2. निम्नलिखित रचनाकारों की काव्यगत वि□ाशताएँ एवं साहित्यिक प्रदेय

सरहपा, अमीर ख्सरो, विद्याापति, कबीर, रैदास, नानक, जायसी, तुलसी, सूरदास, केशवदास, घनाानंद, बिहारी, भारतेन्दु, मैथलीशरणगुप्त, प्रसाद, निराला, महीदेवी, पंत, दिनकर, नागार्जुन, अज्ञेय, मुक्तिबोध, सर्वेश्वर दयाल, रघुवीर सहाय, नरेश मेहता, अशोक बवजपेयी, धूमिल, शमशेर बहादुर, अरुण कमल, राजेश जोशी आदि।

3. निम्नलिखित रचनाओं की व्याख्या तथा आलोचनाः

1. कबीर गंथावली, श्यामसुन्दर दास आरम्भ से 30 पद, साखी–सतगुरु कौ अंग, सुमिरन भजन कौ अंग, परचा कौ अंग, विरह कौ अंग
2. जायसी कृत पद्मावत– सिंहल दीप, मानसरोवर एवं नागमती विरह वर्णन
3. सूरदास– भ्रमरगीत, आरमी से 50 पद
4. तुलसीदास– रामचरीतमानस, उत्तरकाण्ड
5. बिहार– बिहारी सतसई के आरम्भिक 150 दोहे(पाठ बिहारी रत्नाकर)
6. निराला– राम की शक्ति पूजा, सरोज समृति, अधिवास कुकुरमुत्ता, वह तोड़ती पत्थर

7. प्रसाद– कामायनीः चिन्ता, श्रद्धा, इडा
8. नरेश मेहता– संशय की रात
9. मुक्तिबोध– ब्रह्मराक्षस
10. धूमिल– पटकथा
11. प्रेमचंद– गोदान
12. फणीश्वरनाथ रेणु– मैलस आँचल
13. भारतेन्दु– भारत दशा
14. प्रसाद– स्कन्द गुप्त, ध्रुवस्वामिनी
15. मोहन राकेश– आषढ़ का एक दिन

साहित्य□ास्त्र एवं आलोचना भारतीय काव्य□ास्त्र के विभिन्न सम्प्रदाय

रस, ध्वनि, वक्रोति, अलंकार, औचित्य हिन्दी के प्रमुख आचार्य एवं उनका प्रदेय– अरस्तू का विरेचन सिद्धान्त, अनुकरण ट्रैजिडी।

स्वच्छन्दतावादी आलोचना के प्रतिमान–

क्रोंचे की सौन्दर्य दृष्टि तथा काव्य दृष्टि, नई समीक्षा, समकालीन आलोचना उनके सिद्धान्त– रोलावार्थ, देरिदा, संरचना, पाठ और विच्छेद, विमर्श केन्द्रित आलोचना– स्त्री विमर्श, दलित विमर्श, संस्कृति विमर्श, हिन्दी आलेचना की आलेचना दृष्टि– बालकृष्ण भट्ट, महावीरप्रसाद द्विवेदी, रामचन्द्र शुक्ल, हजारी प्रसाद द्विवेदी, नन्द दुलारे बाजपेयी, नगेन्द्र, रामविलास शर्मा, नामवर सिंह, रामस्वरुप चतुर्वेदी

HISTORY (MEDIEVAL& MODERN)

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.

HOME SCIENCE

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

LAW

1. Constitutional Law of India

Preamble

Essential Features of 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

2. 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

3. 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

4. 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

5. 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

6. 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

7. 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

8. 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

9. 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

Material 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

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.

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; 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, countability and separation axioms; Homotopy of maps, Fundamentals groups.

Differential Equations: Ordinary and Partial differential equations of first and second order, Solution techniques, Existence theory for Ordinary differential equations; Laplace transforms, Power series methods: Legendre and Bessel functions; 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 topology; Hilbert spaces, orthonormal bases, Rieses Representation Theorem, Self-adjoint and Normal operators.

Mechanics: Lagrange's and Hamiltonian eqations of Motion, Euler's dynamical Equations, Contact transformations, Poisson's brackets; Equation of Fluid Motion and Equation of Continuity.

Operation Research: Linear Programming Problem, Convex sets, Simplex Method, Transportation Problems, Assignment Problems, Game Theory.

Differential Geometry: Elementary theory of curves and surfaces in Euclildian 3-space; differentiable Manifolds, Tensors.

MUSIC AND 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.

(01) 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.

NUTRITIONAL SCIENCE

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 -

PERSIAN

PAPER–II and PAPER—III (Part A & B)

The syllabus is divided into the following **six** different parts. The first four headings consists of two units each, i.e., eig. units and the remaining two headings form one unit each, i.e., the ninth and the 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

دورۂ آغازز بانوادبیات فارسی درهند
دورۂ 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 البحرين
سفینۃالاولیاء
چهارعنصر
آتشکده
خزانۂ عامره
سه نثرظهوری
چهارچمن
دستنبو

Modern Persian Literature

General information regarding

آغازنثرجدید
روزنامه نویسی درایران
فرق بین شعرکلاسیك وشعرجدید
ادبیات دورۂ مشروطیت

Eminent authors

دهخدا
زین العابدین مراغه 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

PHILOSOPHY

1. **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.

2. **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.

3. **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.

4. **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

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.

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.

POLITICAL SCIENCE

1. 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.

2. 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.

3. 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.

4. 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.

5. 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.

PSYCHOLOGY

1. Perceptual Processes:

Approaches to the study of Perception: Gestalt and Physiological approaches Perceptual Organisation: Gestalt, Figure and Ground, Laws of Organisation Perceptual Constancy: Size Shape and Brightness, Illusion; Perceptual of Depth and Movements.
Role of Motivation and Learning in Perception.

2. Learning Process:

Classical Conditioning: Procedure, Phenomena and related issue
Instrumental earning: Phenomena, Paradigms and Theoretical issues
Reinforcement: Basic Variables and Schedules
Verbal Learning: Methods and Materials, Organizational Processes

3. Memory and Forgetting:

Memory Processes: Encoding, Storage, Retrieval
Stages of Memory: Sensory Memory, Short-term Memory (STM) and Long-term Memory (LTM).
Episodic and Semantic memory
Models of Memory: Atkinson and Shiffrin, Craik and Lockhart, Turving
Long-term memory: Retrieval Cues, Flashbulb memory, Constructive Processes in Memory, Eyewitness Testimony, Autobiographical Memory.

4. Thinking and Problem Solving:

Theories of thought processes: Associationism, Gestalt, Information Processing
Concept Formation: Rules and Strategies
Reasoning: Deductive and Inductive
Problem-solving: Type and Strategies
Role of Concept in thinking
Cognitive Strategies: Algorhythms and Heuristics
Convergent and Divergent Thinking
Decision-making; impediments to problem-solving
Creative thinking and problem-solving
Language and thought

5. Motivation and Emotion:

Basic Motivation Concepts: Instincts, Needs, Drives, Incentives, Motivational Cycle.
Approaches to the Study of Motivation: Psychoanalytical, Behaviouristic Cognitive, Humanistic.
Biological Motives: Hunger, Thirst, Sleep and Sex
Social Motives: Achievement, Affiliation, Approval
Exploratory Behaviour and Curiosity
Competence, Intrinsic Motivation and Attribution
Physiological Correlates of Emotions
Theories of Emotions: James-Lange, Canon-Bard, Schechter and Singer
Components of Emotion: Physiological, Expressive and Cognitive
Neural Mechanism of Emotion: Central and Peripheral

Current Theories of Emotions and Facial Feedback Hypothesis

6. Human Abilities:

Intelligence: Biological, Social, Eco-cultural determinants
Theories of Intelligence: Spearman, Thurston, Guilford
Individual and Group Differences: Extent and Causes
Measurement of Human Abilities

7. Personality:

Determinants of Personality: Biological and Socio-cultural
Approaches to the study of Personality: Psychoanalytic, Neo-Freudian, Social Learning, Trait and Type, Cognitive Approaches
Existential and Humanistic Theories of Personality: Frankl, Rollo May, Maslow, Rogers
Personality Assessment: Psychometric and Projective Tests and Behavioural Measures.
Self-concept: Origin and Development

8. Psychological Statistics:

Basic Concepts; use of statistics in Psychology; variables-contuinous and categorical.
Scales of measurement-nominal ordinal, interval and ratio
Descriptive and inferential statistical; data organizing and processing of data
Organizing data in frequency distribution
Calculation of Mean, Median and Mode from row and grouped data
Concept of Variability
Centiles and Percintiles Rank (PR)

9. Research Methodology:

Research Problems, Hypothesis, Variables and their Operationalisation
Measurement in Psychological Research, Problem and Issues
Types of Psychological Research, Survey Research, Sample Surver, Telephone Survey, Market Survey
Methods of Psychological Research: Experimental, Quasi-experimental, Case Studies, Field Studies and Cross-Culture Studies.
Methods of Data Collection: Organisation, Interview, Questionnaire, tests and scales.
Non-parametric tests
Ethical problems in Experimental Research

10. Measurement and Testing:

Test Construction: Item writing, Item Ananlysis
Test Standardization: Reliability, Validity and Norms
Types of Tests: Intelligence, Aptitude, Personality – Characteristics and Important Examples.
Attitude Scales and Interest Inventories
Educational Measurement and Evaluation

11. Biological Basic of Behaviour:

Receptors, Effectors and Adjuster Mechanisms
Neural Impulse: Origin, Conduction and Measurement
Sensory System: Vision and Audition
Human Nervous System: Structure and Functions
Methods of Physiological Psychology: Lesion and Brain Stimulation
Sleep and Waking: Stages of Sleep, Disorders of sleep and Physiological mechanisms of sleep and waking.
Endocrine System: Chemical and Glandular

Specialised Course:

Social Psychology:

I. Current Trends in Social Psychology – Past, Present and Future
Social Cognition – Person Perception

Social Influence – Conformity, Attitudes, Attitudes Change and Majority, Minority influences.

Social nature of self and identity prejudice and discrimination social Psychology of disadvantage and poverty.

Developmental Psychology:

II. Development Processes: Nature, Principles and Related Concepts – Maturity, Experience Factors in Development: Biogenic Psychogenic and Sociogenic.

Stage of Development: Theories of Development: Psychoanalytic Behaviouristic and Cognitive

Various aspects of Development: Sensory-motor, Cognitive, Language, emotional, Social and Moral.

Organizational Psychology:

III. Development of Industrial and Organisation Psychology
Selection Process in Organisation
Organisational Training
Performance Appriaisal
Motivation and Work
Leadership
Work Environment, Work Values in Organisation
Oraganisational Behaviour: Theories, Socialisation, effectiveness

Clinical Psychology:

IV. Psychopathology: Concepts, Classification and Causes: Clinical Diagnostics
Common Clinical Disorders
Freud's Theory of Neurosis, existential Perspectives on Psychopathology,
Beck's Congnitive Model of Depression
Mental Health: Intervention Models and Psychotherapies
Community Mental Health and Prevention
Indian Perspective on Psychotherapy

V. Health Psychology:

Overview of Psychology and Health
What is Health: Viewpoints from History, Current Perspectives on Health and Illness
Stress and Coping: Meaning, Impact and Sources
The Development of Stress Models: Psychological Factors in Stress
Measuring Stress
Coping: Social Support, Personality Control.

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 (त्र) सुबुन्ध (ट) दण्डी (ठ) वर्णव्यवस्था (ड) आश्रमव्यवस्था (ढ़) नारीशिक्षा

भाशिक 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– महावाक्ययार्थ

काव्यप्रका□ा– (नवम् एवम् दशम् उल्लास)

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

निम्नलिखित की सिद्धि प्रक्रिया–

राम, सर्व, विश्वपा, हरि सखि, क्रोष्टु, भानु, धातृ, गो, रमा, मति, गौरी, ज्ञान, मधवत्, तद्, अस्मद्, उपनाह्, इदम्। तद्धित प्रक्रण–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 ि,तीय अध्याय) माध्यन्दिन संहिता
4. वजसनेयि प्रतिशाख्य– एक से तीन
5. शतपथ ब्राह्मण प्रथम काण्ड– (स्रुक् सम्मार्जनम् र्प्यन्त)
6. ऋक् प्रातिशाख्य 1, 2, 3, 6 पटल
7. निरुक्त द्वितीय तथा सप्तम अध्याय
8. बहिस्तून शिलालेख

साहित्य वर्ग

काव्य–प्रका□ा– (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 सिद्धाान्त (रस सूत्र की व्याख्यायें), गुणीभूतव्यंग्य के भेद, व्यंजना की अपरिहार्यता, दोष–स्वरुप, गुणालंकार स्वरुप 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 संवााद।

द□ारुपक– कारिकाओं की व्याख्या एवं प्रश्न नाट्यलक्षण, अर्थप्रकृतियाँ, कार्यावस्थायें(सन्ध्यंगो को छोड़कर), अर्थपक्षेपक नाट्यवृत्तियों, रुपकों के भेद एवं लक्षण, रस, स्वरुप, नाट्य में शान्तरस, रससिद्धान्त खण्डन मण्डन 37 वीं कारिका पर्यन्त।

रसगंगाधर– प्रथम आनन (रस–स्वरुप निरुपण पर्यन्त) काव्य लक्षण– पण्डित राज का स्वभिमत, अन्य लक्षणें का आक्षेप

कान्य कारण– प्रतिभा का स्वरुप, प्रतिभा के कारण काव्य भेद– उत्तमोत्तम, उत्तम, मध्यम, अधम

रस–स्वरुप– स्वमतस्थापन, रसविषयक विविध सम्मतियाँ विप्रतिपत्तियाँ एवं समाधान

नैशधीयचरितम्– (प्रथम सर्ग) हिन्दी अनुवाद व्याख्या एवं प्रश्न

□ा□ुपालवधम्– (प्रथम सर्ग) हिन्दी अनुवाद एवं प्रश्न

नलचम्पू– प्रथम उच्छ्वास (वर्षावणन पर्यन्त हिन्दी एवं प्रश्न)

रत्नावली– (सम्पूर्ण) हिन्दी अनुवाद, संस्कृत व्याख्या एवं प्रश्न

र्दान वर्ग

1. **न्याय सूत्र, वात्स्यायन भाश्य से**
   (क) प्रमाण

(ख) सिद्धाान्त
(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) लौकि 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. **ब्रह्मसूत्र□ांकर भाश्य 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. वेदार्थसङ् ग्रह– शांकरमत प्रतिक्षेप पर्यन्त।
3. पंचदशी– प्रथम प्रकरण से पंचम प्रकरण पर्यन्त।

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.

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 function in purely discrete, absolutely continuous and singular components, C_r –inequality, Cauchy–Schwartz inequality, Holder inequality. Minkowski inequality, Jensen inequality, Lyapunov inequality, Kolmogorov inequality, Hajek–Renyki 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.

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.

Multivariate Analysis: Multivariate normal distribution, Characteristic function, Maximum likelihood estimators of the mean vector and covariance matrix, Mutiple and partial correlation coefficients and their null sampling distributions, Wishart distribution Hotteling's T_2, Mahalanobis' D_2 and their applications.

Statistical Inference: Radon Nikodyn theorem and derivative, Conditional expectation using Radon Nikodym derivarive, 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 Rao Cramer bound for the multiparameter case, Maximum likelihood estimation, Zehna theorem for invariance, Cramer theorem for weak consistency, asymptotic normality, BAN and CAN estimators asymptotic efficiency, equivariant estimation, relation between confidence estimation and hypothesis testing, Generalized Neyman Pearson lemma, UMP tests for distributions with MLR, LR, tests and their properties UMPU tests, similar regions, Neyman structure, Invariant tests.

Analysis of Variance and Design of Experiments: 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 the without replacement, cumulative total and Lahiri's methods of selection, Estimation of population mean, Desraj ordered estimates, Horwitz–Thompson 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.

Nonparametric Inference: 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–Smirov tests, Run tests, Pitman ARE.

Econometrics: Linear regression model, assumptions, estimation of parameters by least squares and maximum likelihood methods, test of hypothesis and confidence estimation for regression coefficients, R^2 and adjusted R^2, 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, multicollinearity consequences and solutions, estimation of parameters by generalized least squares in models with non–spherical disturbances, heteroscedasticity of disturbances, estimation under heteroscedasticity estimation under autocorrelated disturbances, errors in variable models, inconsistency of least squares method, instrumental variable method, 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 and limited information maximum likelihood estimation, idea of three stage least squares and full information maximum likelihood estimation.

URDU

(Masnavi & Qasida)

Masnaui: Qutub Mushtari, Bajal Kahani, Sahrul Bayan, Gulzar e Naseem, Zahe Ishq, Saqi nama-

Qasida:
1 Uth Gaya Bahman o day Ka Sauda
2 Zahe Naseeb Agar Keejye Zauq
3 Dher guz jaluai yaktai 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, Ismat chughtai. Q.A. Haider.

(Marsiya)
1 Qasam Kahe Di khao Satahi Hashim Ali
2 Kaha Ashk ne yun Jeth ke Sauda
3 Kis Noor ki Majlis men Zameer
4 Bakhuda Fase 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 (Fort eilliam, Delhi College)
4 Ali Garh Tahreek
5 Taraqqi Pasand 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, Shjaed Fami, Badayuni, Hasrat, Firaq Gorakhpuri, Faiz, Nasi Kazmi-

(Nazm)

Nazar Akbarabadi: 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: Faryade Qaum, 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, Jangal ke Shahzadi, Fakhta ke Awaz.

Faiz: All Poems of Daste Saba

Majaz: Awara, Rat aur Ratin.

Sardar Jafri: Ek khwab aur , Zindagi , Salam. Arzoo ke Sanam Khane .

Makhdoom: Yad Hai. Intizar. Hareli. Jang. Qzadi.

(Dastan aur Nawel)

(Dastan)
1 Bagh o Bahar Meer Amman
2 Fasanai Ajaif Rajjab Ali
3 Gulshane Nau Bahar Mehjoor
4 Fasanai Azad R.N. Shar Sher

(Nowel)
1 Taubatun Nasooh Nazeer
2 Firdaus Bareen A,H. Saroor
3 Umrao Jaan Ada Hadi Ruswa
4 Gau Daan Premchand
5 Teerhi Lakeer Ismat chughtai
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

VISUAL ARTS / PAINTING

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.

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.