

## **INFORMATION BROCHURE**

**FOR  
ADMISSION TO  
PhD PROGRAMME  
(JULY 2020 SESSION)**



**RESEARCH UNIT  
Indira Gandhi National Open University  
Maidan Garhi,  
New Delhi-110 068  
[www.ignou.ac.in](http://www.ignou.ac.in)**

**NTA-Helpline numbers **0120-6895200** between 09:00 am to 6:00pm.**

**For queries applicants may contact :**  
**[researchunit@ignou.ac.in](mailto:researchunit@ignou.ac.in)**  
**011-29571984/85/98/86**  
**From 10.00 A.M. to 5.30 P.M**  
**Monday to Friday (excluding Gazette holidays)**



**Candidates are required to apply online only. The Online Link for PhD Entrance Portal is as under : <http://ignouexams.nta.nic.in/> The online portal for submission of applications will be operational from 28<sup>th</sup> February, 2020.**

## **1. GENERAL INFORMATION**

- a) Applications are invited for admission to Ph.D programme in selected disciplines for the July 2020 session. The list of disciplines, name of the Programme coordinators and discipline wise number of seats available are given in **Appendix II**.
- b) The Ph D Programme is offered in strict compliance of the UGC (Minimum Standards and Procedure for award of M.Phil/ Ph.D Degrees) Regulations, 2016 and amendments thereto from time to time.
- c) Selected candidates will be governed by IGNOU Ordinance/IGNOU Regulation/Guidelines for conducting Ph.D Degree Programme.
- d) Entrance Test is compulsory for all candidates applying for admission to Ph.D Programme.
- e) Admission to the Ph.D Degree Programme is strictly on merit, based on the performance in the Entrance Test and Interview.
- f) The syllabus of the Entrance Test shall be as per the ‘University Grants Commission (Minimum Standards and Procedures for Award of MPhil / PhD Degrees) Regulations, 2016 consisting of 50% of Research methodology and 50% subject specific.
- g) The question paper shall have total 100 questions consisting of 50% on research methodology and 50% on specific subject.
- h) All the questions shall be Multiple Choice questions (MCQ) with 4 options and only one correct answer. There shall be no negative marking.
- i) The Entrance Test shall have a 70% weightage and 30% weightage shall be given to the interview/viva.
- j) IGNOU offers Ph.D programme under two categories: Part time and Full time. Both categories of students will be required to attend classes, if course work is allotted to them.
- k) The minimum and maximum duration of Ph.D programme is three years and six years respectively. The Women Candidates and Persons with Disabilities (40% or more / “severe” where percentage is not defined ) are given two years extra in the maximum duration.
- l) The Ph.D programme involves coursework during the first six months of admission, which will be conducted in IGNOU Campus at New Delhi only. A student has to attend the coursework on a regular basis. At least 80 per cent attendance is compulsory.

- m) As of now IGNOU does not have hostel facilities for students. Students have to make their own arrangements for stay in Delhi.

## **2. ELIGIBILITY CRITERIA FOR Ph.D.**

The eligibility criteria for admission to Ph.D programme are as follows:

- a) Master's Degree from a University recognized by UGC in the relevant discipline with atleast 55% marks [50%marks in the case of SC,ST and OBC(Non-creamy Layer)/Differently-Abled and other categories of candidates as per the decision of UGC from time to time, or for those who had obtained their Master's Degree prior to19th September,1991] excluding grace marks.
- b) See Appendix II for further details.

## **3. SELECTION PROCEDURE**

### **Stage 1: Entrance Test**

- a) The Entrance Test will be conducted by NTA at National Level across the country. The list of eligible candidates to appear for the Entrance Test will be displayed on NTA website.
- b) No separate communication shall be sent to candidates in this regard.
- c) Hall Tickets enabling the candidates to take the Entrance Test will also be displayed on NTA website. Candidates are required to download and print the same to appear in the Entrance Test.
- d) Candidates are required to bring with them an original identity proof having photograph, such as Aadhar Card, Voter ID Card, Driving License, Passport and ID Card issued by Govt. Agencies.
- e) Those who secure at least 50% marks in the Entrance Test (45% marks in case of SC/ST/OBC (Non Creamy layers) / Differently abled persons ) will be shortlisted for the interview in order of merit subject to the maximum limit of five times of the available seats.

### **Stage 2: Interview/ Presentation**

- a) Short-listed Candidates in the Entrance Test will be called for interview/presentation of Synopsis before the Discipline specific Doctoral Research Committee.
- b) Offer letters for admission will be sent to the Selected Candidates only.

### Important Dates

- Last date for submission of online application - 23<sup>rd</sup> March, 2020
- Downloading of Admit Cards from NTA website - 09<sup>th</sup> April, 2020 onwards
- Entrance Test - 29<sup>th</sup> April, 2020
- Declaration of Entrance Result – 8<sup>th</sup> May, 2020
- Timing of Examination –02:30 PM to 05:30 PM

#### Application fee (Non-refundable)

**For Online Application to PhD Programme (July 2020)**

**is Rs.1000/- (for candidates belonging to General/ OBC)**

**Rs.800/- (for candidates belonging to SC/ST/EWS)**

#### Note:

1. The candidates before applying for PhD Entrance Test must ensure their eligibility to appear the test and to go through the specific criteria (Appendix-I) before applying for a particular discipline.
2. The candidates are required to download the filled in registration / application form for future reference.
3. Candidates are required to apply online only. No offline/hardcopy of the application form will be accepted.
4. A list of States and Cities for Research Entrance Examination is given in **Appendix-I**.
5. While applying, candidates must select **four** Examination City Centres in order of their preference. Since the seating capacity at each centre is limited, they will be considered for the allotment of the examination city centres as per NTA norms.
6. NTA can change the examination city centre opted by the candidate to another nearby centre, if number of candidates are more/less at any examination city centre.
7. **The Examination City Centre, once opted, shall not be changed.**
8. **The Admit Card will be uploaded on NTA website <https://ignouexams.nta.nic.in>. Please check the admit card carefully for your Name, Subject Group, Date of Birth, Gender, Examination Centre Name, City, and Category, etc.**
9. Reservation of seats shall be as per Government of India rules.
10. For any discipline specific query at any stage, candidates are advised to contact the concerned Programme Coordinator (see Appendix II)
11. For Discipline specific syllabus for Entrance Test please refer to Appendix III



- 12. Being called for interview does not entitle a candidate to stake claim for admission. The Doctoral Research Committee may not recommend a candidate if the discipline does not have the specialization in which he/she wants to carry out research.**
- 13. The University reserves all the rights not to fill up some or all the seats vacant in a Research Degree programme in case suitable candidates are not found at the level of Test/ Interview**

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## Appendix - I

### Cities for NTA-IGNOU Research Entrance Test on 29th April, 2020

S.No.	State	City	City Code
1	Andhra Pradesh	Chirala	AP04
2	Andhra Pradesh	Guntur	AP07
3	Andhra Pradesh	Kakinada	AP09
4	Andhra Pradesh	Kurnool	AP10
5	Andhra Pradesh	Nellore	AP11
6	Andhra Pradesh	Rajahmundry	AP13
7	Andhra Pradesh	Tirupathi	AP16
8	Andhra Pradesh	Vijayawada	AP17
9	Andhra Pradesh	Visakhapatnam	AP18
10	Andhra Pradesh	Vizianagaram	AP19
11	Arunachal Pradesh	Itanagar	AL01
12	Assam	Dibrugarh	AM01
13	Assam	Guwahati	AM02
14	Assam	Jorhat	AM03
15	Assam	Silchar	AM04
16	Assam	Tezpur	AM05
17	Bihar	Arrah	BR09
18	Bihar	Bhagalpur	BR02
19	Bihar	Darbhanga	BR04
20	Bihar	Muzaffarpur	BR06
21	Bihar	Patna	BR07
22	Bihar	Purnea	BR08
23	Chandigarh	Chandigarh/Mohali	CH01
24	Chhattisgarh	Bhilai Nagar	CG01
25	Chhattisgarh	Bilaspur	HP01
26	Chhattisgarh	Raipur	CG03
27	Delhi -NCR	Delhi/New Delhi	DL01
28	Delhi -NCR	Faridabad	HR03
29	Delhi -NCR	Ghaziabad	UP07
30	Delhi -NCR	Greater Noida/Noida	UP09
31	Delhi -NCR	Gurugram	HR04
32	Delhi -NCR	Meerut	UP14
33	Goa	PANAJI/MADGAON	GO01



34	Gujarat	Ahmedabad/Gandhinagar	GJ01
35	Gujarat	Anand	GJ02
36	Gujarat	Mehsana	GJ08
37	Gujarat	Rajkot	GJ10
38	Gujarat	Surat	GJ11
39	Gujarat	Vadodara	GJ12
40	Haryana	Ambala	HR01
41	Haryana	Yamuna Nagar	HR10
42	Himachal Pradesh	Shimla	HP06
43	Haryana	Kurukshetra	HR07
44	Himachal Pradesh	Hamirpur	HP03
45	J&K	Jammu	JK02
46	J&K	Srinagar (J & K)	JK04
47	Jharkhand	Bokaro	JH01
48	Jharkhand	Dhanbad	JH02
49	Jharkhand	Hazaribagh	JH05
50	Jharkhand	Jamshedpur	JH03
51	Jharkhand	Ranchi	JH04
52	Karnataka	Belagum	KK02
53	Karnataka	Bengaluru	KK04
54	Karnataka	Hubballi(Hubli)	KK10
55	Karnataka	Kalaburagi(Gulbarga)	KK08
56	Karnataka	Mangaluru(Mangalore)	KK12
57	Karnataka	Mysuru(Mysore)	KK14
58	Karnataka	Shivamogga(Shimoga)	KK15
59	Karnataka	Udupi	KK17
60	Kerala	Ernakulam	KL04
61	Kerala	Kannur	KL07
62	Kerala	Kollam	KL09
63	Kerala	Kottayam	KL11
64	Kerala	Kozhikode	KL12
65	Kerala	Thrissur	KL18
66	Kerala	Trivandrum	KL17
67	Madhya Pradesh	Bhopal	MP03
68	Madhya Pradesh	Gwalior	MP06
69	Madhya Pradesh	Indore	MP07
70	Madhya Pradesh	Jabalpur	MP08
71	Madhya Pradesh	Sagar	MP12
72	Madhya Pradesh	Satna	MP13
73	Madhya Pradesh	Ujjain	MP15
74	Maharashtra	Amravati	MR03

75	Maharashtra	Aurangabad	MR04
76	Maharashtra	Jalgaon	MR13
77	Maharashtra	Kolhapur	MR14
78	Maharashtra	Mumbai	MR16
79	Maharashtra	Nagpur	MR17
80	Maharashtra	Nanded	MR18
81	Maharashtra	Nasik	MR19
82	Maharashtra	Pune	MR22
83	Meghalaya	Shillong	MG01
84	Mizoram	Aizawl	MZ01
85	Nagaland	Kohima	NL02
86	Odisha	Balasore	OR02
87	Odisha	Berhampur	OR03
88	Odisha	Bhubaneswar	OR04
89	Odisha	Cuttack	OR05
90	Odisha	Dhenkanal	OR06
91	Odisha	Rourkela	OR08
92	Odisha	Sambalpur	OR09
93	Punjab	Amritsar	PB01
94	Punjab	Bhatinda	PB02
95	Punjab	Jalandhar	PB04
96	Punjab	Ludhiana	PB05
97	Punjab	Patiala	PB08
98	Rajasthan	Ajmer	RJ01
99	Rajasthan	Bikaner	RJ05
100	Rajasthan	Jodhpur	RJ07
101	Rajasthan	Sikar	RJ09
102	Rajasthan	Udaipur	RJ11
103	Tamil Nadu	Chennai	TN01
104	Tamil Nadu	Coimbatore	TN02
105	Tamil Nadu	Madurai	TN08
106	Tamil Nadu	Salem	TN11
107	Tamil Nadu	Tirunelveli	TN15
108	Tamil Nadu	Trichy	TN14
109	Tamil Nadu	Vellore	TN18
110	Telangana	Hyderabad	TL01
111	Telangana	Karimnagar	TL02
112	Telangana	Warangal	TL07
113	Uttar Pradesh	Agra	UP01
114	Uttar Pradesh	Aligarh	UP02
115	Uttar Pradesh	Allahabad	UP03

116	Uttar Pradesh	Bareilly	UP04
117	Uttar Pradesh	Gorakhpur	UP08
118	Uttar Pradesh	Jhansi	UP10
119	Uttar Pradesh	Kanpur	UP11
120	Uttar Pradesh	Lucknow	UP12
121	Uttar Pradesh	Moradabad	UP15
122	Uttar Pradesh	Muzaffarnagar	UP16
123	Uttar Pradesh	Varanasi	UP18
124	Uttarakhand	Dehradun	UK01
125	Uttarakhand	Haldwani	UK02
126	Uttarakhand	Roorkee	UK06
127	West Bengal	Asansol	WB01
128	West Bengal	Hooghly	WB06
129	West Bengal	Kalyani	WB08
130	West Bengal	Kolkata	WB10
131	West Bengal	Siliguri	WB11

### Appendix- II

#### Discipline-wise Vacancy of Seats/ Specific eligibility criteria and Programme Coordinators

Sl No	School	Discipline	PhD vacancies	Name of Programme Coordinator / Contact	Eligibility Criteria
1.	School of Social Sciences (SOSS)	Anthropology (PHDAN)	GEN – 07 SC - 01 ST - 00 OBC – 03 EWS – 01	Dr. K. Anil Kumar <a href="mailto:anilkumaranthro@gmail.com">anilkumaranthro@gmail.com</a> / <a href="mailto:anionline1@rediffmail.com">anionline1@rediffmail.com</a>	Post Graduation in Anthropology and Allied disciplines
			Total - 12	011-29572747	
2.		Economics (PHDEC)	GEN – 05 SC - 01 ST - 00 OBC – 01 EWS – 00	Prof. Narayan Prasad <a href="mailto:nps20@rediffmail.com">nps20@rediffmail.com</a>  01129572708	Master's Degree or M.Phil. Degree in Economics
3.		Library & Information Science (PHDLIS)	GEN – 06 SC - 01 ST - 00 OBC – 02 EWS – 00	Dr. Z. Yanthan <a href="mailto:zyanthan@ignou.ac.in">zyanthan@ignou.ac.in</a>  011-29572723	Master's Degree and/or M.Phil. Degree in Library and Information Science
			Total - 09		
4.		Political Science (PHDPS)	GEN – 03 SC - 00 ST - 00 OBC – 00 EWS – 00	Prof. Anurag Joshi <a href="mailto:anuragjoshi@ignou.ac.in">anuragjoshi@ignou.ac.in</a>  011-29572714	Master's Degree and/or M.Phil. Degree in Political Science or allied disciplines
			Total - 03		
5.		Psychology (PHDPC)	GEN – 09 SC - 02 ST - 01 OBC – 04 EWS – 01	Prof. Suhas Shetgovekar <a href="mailto:sshetgovekar@ignou.ac.in">sshetgovekar@ignou.ac.in</a>  Dr. Monika Misra <a href="mailto:monikamisra@ignou.ac.in">monikamisra@ignou.ac.in</a>  011-29572721 011-29572781	Master's Degree and/or M.Phil. Degree in Psychology
			Total - 17		

6.		Public Administration (PHDPA)	GEN – 08 SC - 02 ST - 01 OBC – 04 EWS – 01 <b>Total - 16</b>	Prof. Uma Medury <a href="mailto:umamedury@ignou.ac.in">umamedury@ignou.ac.in</a> 011-29572741	Master's Degree and/or M Phil Degree in Public Administration
7.		Sociology (PHDSOC)	GEN – 08 SC - 01 ST - 01 OBC – 03 EWS – 01 <b>Total - 14</b>	Dr. Kiranmayi Bhushi <a href="mailto:kiranmayi@ignou.ac.in">kiranmayi@ignou.ac.in</a> 011-29572709	Master's Degree and/or M.Phil. Degree in Sociology or allied disciplines
8.	School of Sciences (SOS)	Bio Chemistry (PHDBC)	GEN – 06 SC - 01 ST - 00 OBC – 02 EWS – 01 <b>Total - 10</b>	Dr. Md. Abdul Kareem / Dr. Seema Kalra <a href="mailto:abdul.kareem@ignou.ac.in">abdul.kareem@ignou.ac.in</a> 011-29572837 <a href="mailto:seemakalra@ignou.ac.in">seemakalra@ignou.ac.in</a> 011-29572819	Master's Degree from a recognized university or any other qualification recognized as equivalent thereto in Biochemistry/ allied subjects.
9.		Chemistry (PHDCHEM)	GEN – 06 SC - 01 ST - 00 OBC – 03 EWS – 01 <b>Total - 11</b>	Prof. J. Farooqui <a href="mailto:jafarooqi@ignou.ac.in">jafarooqi@ignou.ac.in</a> 011-29572822	M.Sc. Chemistry from any recognized University/other qualification recognized as equivalent thereto in such fields of study as are notified for the purpose from time to time by the University.
10.		Geography (PHDGEOG)	GEN – 08 SC - 02 ST - 01 OBC – 03 EWS – 01 <b>Total - 15</b>	Dr. Vishal Warpa <a href="mailto:vishalwarpa@ignou.ac.in">vishalwarpa@ignou.ac.in</a> 011-29571674	M.A./M.Sc. in Geography, Earth Systems Science and Relevant Discipline of Geospatial Technology”
11.		Geology (PHDGY)	GEN - 03 SC- 00 ST- 00 OBC- 01 EWS- 00 <b>Total - 04</b>	Dr. Omkar Verma Dr. M. Prashanth <a href="mailto:mprashanth@ignou.ac.in">mprashanth@ignou.ac.in</a> <a href="mailto:omkarverma@ignou.ac.in">omkarverma@ignou.ac.in</a> 011-29571675	Post Graduation in Geology or Geological Science or Applied Geology or Geo-Exploration or Mineral Exploration or Engineering Geology or Marine Geology or Earth Science and Resource Management or Petroleum Geosciences or Petroleum Exploration or Geochemistry or Geophysics or Hydrogeology or Geomatics or

					Geoinformatics or Remote Sensing and GIS from any recognized University.
12.		Statistics (PHDSTAT)	GEN – 07 SC - 01 ST - 00 OBC – 03 EWS – 01 <b>Total – 12</b>	Dr. Neha Garg <a href="mailto:nehagarg@ignou.ac.in">nehagarg@ignou.ac.in</a> 011-29572806	Master Degree in Statistics / Applied Statistics. Available Research Area : Estimation and Sampling Techniques, Reliability Modeling, Statistical Inference.
13.	School of Continuing Education (SOCE)	Food & Nutritional Science (PHDFN)	GEN – 04 SC - 00 ST - 00 OBC – 01 EWS – 00 <b>Total - 05</b>	Prof. Deeksha Kapur <a href="mailto:deekshakapur@ignou.ac.in">deekshakapur@ignou.ac.in</a> 011-29572960	A Master's Degree (M.Sc.) in Food and Nutrition / Dietetics / Public Health Nutrition or an equivalent grade from a recognized institution with UGC-NET qualified.
14.		Home Science (PHDHC)	GEN – 03 SC - 00 ST - 00 OBC – 01 EWS – 00 <b>Total - 04</b>	Prof. Heena K. Bijli <a href="mailto:heenakbijli@ignou.ac.in">heenakbijli@ignou.ac.in</a> 011-29572948	M.Sc. in Home Science with a specialization in Community Resource Management and Extension / Family and Community Resource Management / Development Communication and Extension / Resource management and Design Applications/ Extension / Extension Education and Communication / M.Sc. Home Science (General)
15.	School of Management Studies (SOMS)	Commerce (PHDCOM)	GEN – 05 SC - 01 ST - 00 OBC – 01 EWS – 00 <b>Total – 07</b>	Dr. Madhulika P. Sarkar <a href="mailto:Madhulikap.sarkar@ignou.ac.in">Madhulikap.sarkar@ignou.ac.in</a> 011-29573023	Masters Degree in Commerce or any other allied discipline from any recognized University/Institute of higher learning
16.		Management (PHDMGMT)	GEN – 03 SC - 01 ST - 00 OBC – 01 EWS – 00 <b>Total - 05</b>	Prof. Neeti Agarwal <a href="mailto:phdmanagement@ignou.ac.in">phdmanagement@ignou.ac.in</a> 011- 29573020	Master's Degree and/or M. Phil. Degree in Management Studies or in allied disciplines.  The seats are available in Financial Management, Operations Management, Human Resource Management and Marketing Management

17.	School of Education (SOE)	Education (PHDES)	GEN – 10 SC - 03 ST - 01 OBC – 05 EWS – 01 Total – 20	Prof. Amitav Mishra 011-29572999 <a href="mailto:amitav@ignou.ac.in">amitav@ignou.ac.in</a>	MA(Education) or M.Ed.
18.	School of Gender & Development Studies (SOGDS)	Gender & Development Studies (PHDGDS)	GEN – 07 SC - 01 ST - 00 OBC – 03 EWS – 01 Total – 12	Prof. Savita Singh <a href="mailto:savitasingh@ignou.ac.in">savitasingh@ignou.ac.in</a> <a href="http://www.ignou.ac.in">.in</a> 011- 29571613	Master's degree in Gender Studies or Gender & Development Studies with 55%  OR  Master's degree in other streams with one or two courses in the area of Gender Studies or Gender & Development Studies and/or with demonstrable evidence of teaching and / or research and publications in the area of Gender Studies or Gender & Development Studies.
19.	School of Journalism & Mass Communication (SOJNMS)	Journalism & Mass Communications (PHDJMC)	GEN – 05 SC - 01 ST - 00 OBC – 01 EWS – 00 Total – 07	Dr. K.S Arul Selvan <a href="mailto:ksarul@ignou.ac.in">ksarul@ignou.ac.in</a> Dr. Shikha Rai 011-29571607  <a href="mailto:shikharai@ignou.ac.in">shikharai@ignou.ac.in</a> 011-29571605	Masters Degree in Communication or related disciplines (Social Sciences and Humanities with demonstrated interest in the Communication and Media Research).
20.	School of Agriculture (SOA)	Dairy Science & Technology (PHDDR)	GEN – 03 SC - 00 ST - 00 OBC – 01 EWS – 00 Total - 04	Prof. M. K. Salooja <a href="mailto:mksalooja@ignou.ac.in">mksalooja@ignou.ac.in</a> <a href="http://www.ignou.ac.in">.in</a> 011-29572976	Master's Degree in Dairy Science (Dairy Technology, Dairy Chemistry, Dairy Microbiology, Dairy Engineering), Food Science/ Food Technology, M.V.Sc. (Animal products technology / Livestock Products Technology / Dairy Science), M.Sc. Agriculture (Dairy Science / Dairy Technology), M.Sc. (Agriculture / Processing and Food Engineering) with B.Tech. in Dairy Technology.

21.	School of Extension & Development Studies (SOEDS)	Development Studies (PHDDV)	GEN – 10 SC - 02 ST - 01 OBC – 04 EWS – 01 Total - 18	Prof. Nehal A. Farooquee <a href="mailto:nafarooquee@ignou.ac.in">nafarooquee@ignou.ac.in</a> 011-29571664	Masters in Development Studies, Extension Education, Economics, Sociology, and Political Science.
22.	School of Computer & Information Science (SOCIS)	Computer Science (PHDCS)	GEN – 04 SC - 00 ST - 00 OBC – 01 EWS – 00 Total – 05	Dr. V. V. Subrahmanyam <a href="mailto:vvsbrahmanyam@ignou.ac.in">vvsbrahmanyam@ignou.ac.in</a> 011-29572901/2909	Possesses BE/BTech in Computer Science / IT or Master of Computer Applications (MCA) or M.Sc in Computer Science / IT with at least 55% marks [50% marks in the case of SC, ST, OBC (Noncreamy Layer) and DifferentlyAble and other categories of candidates as per the decision of UGC from time to time, or for those who had obtained their Master's Degree prior to 19th September, 1991]excluding grace mark.
23.	School of Law (SOL)	Law (PHDLE)	GEN – 03 SC - 00 ST - 00 OBC – 01 EWS – 00 Total – 04	Dr. Gurmeet Kaur <a href="mailto:gurmeetkaur@ignou.ac.in">gurmeetkaur@ignou.ac.in</a> 011-29572984	Master's Degree in Law from a University recognized by UGC or any other qualification recognized as equivalent thereto in the field of law as notified for the purpose from time to time by the University.
24.	School of Health Sciences (SOHS)	Nursing (PHDNS)	GEN – 03 SC - 00 ST - 00 OBC – 00 EWS – 00 Total – 03	Prof. Pity Koul <a href="mailto:pkoul@ignou.ac.in">pkoul@ignou.ac.in</a> 011-29572807	Master's Degree and/or M.Phil. Degree in Nursing



25.	School of Social Work (SOSW)	Social Work (PHDSW)	GEN – 06 SC - 01 ST - 00 OBC – 03 EWS – 01 Total – 11	Prof. Rose Neimbiakkim <a href="mailto:rosenembiakkim@ignou.ac.in">rosenembiakkim@ignou.ac.in</a> 011-29571695	MA in Social Work / MSW Degree from a University recognized by UGC
26.	School of Translation Studies (SOTST)	Translation Studies (PHDTT)	GEN – 03 SC - 00 ST - 00 OBC – 00 EWS – 00 Total – 03	Dr. Jagdish Sharma Dr. Rajendra P. Pandey <a href="mailto:jagdishsharma@ignou.ac.in">jagdishsharma@ignou.ac.in</a> <a href="mailto:rajendrapandey@ignou.ac.in">rajendrapandey@ignou.ac.in</a> 011-29571625 011-29571628	Post- Graduate Degree in Translation Studies or allied Subjects viz., Literature, Linguistics
27.	School of Vocational Education and Training (SOVET)	Vocational Education and Training (PHDVE)	GEN – 05 SC - 01 ST - 00 OBC – 02 EWS – 00 Total – 08	Dr. R. S. P Singh <a href="mailto:rspsingh@ignou.ac.in">rspsingh@ignou.ac.in</a> 011-29571645	Master's Degree in Economics, Commerce, Management, Education, Agriculture Extension or Extension Education, Environmental Sciences.
28.	School of Foreign Languages (SOFL)	French (PHDFL)	GEN – 02 SC - 00 ST - 00 OBC – 00 EWS – 00 Total – 02	Dr. Deepanwita Srivastava 011-29571636 <a href="mailto:deepan@ignou.ac.in">deepan@ignou.ac.in</a>	MA/MPhil in French from an Indian or Foreign University

## Appendix- III

### **Discipline wise Specific Syllabus for Entrance Test**

#### **1. Ph. D. in Anthropology (PHDAN)**

##### **Anthropology and Methods of Research**

*Introducing Anthropology:* Defining Anthropology, Meaning, Scope, history, Branches of Anthropology, Emerging Frontiers in Anthropology

*Field Work Tradition in Anthropology:* Field Work and its Relevance, Ethnography, Techniques, Methods and Methodology, Genealogy and Pedigree

*Research Design:* Review of Literature and Statement of Research Problem, Theory, Research Design

*Data Collection Techniques:* Primary Data, Secondary Data, Biological Methods, Archaeological Methods

*Statistical Analysis:* Collection and Presentation of Data, Measures of Central Tendency and Dispersion, Statistical Distribution, Using SPSS for Data Analysis Contents

##### **Physical Anthropology**

*Introduction to Physical Anthropology:* Definition and Scope, Relationship with Other Disciplines, Applied aspects of Physical Anthropology

*Human Evolution:* Principles of Evolution, Theories of Organic Evolution, Synthetic Theory, Palaeoanthropology

*Primate Study:* Living Primates, Primate Behaviour.

*Biological Diversity:* Concept of Race, Characteristic, Criteria of Biological Diversity, Racial Classification

*Human Genetics:* Human Genetics, Methods in Human Genetics, Population Genetics, Aberrations in Chromosomes

*Human Growth and Development:* Principles of Growth, Methods and Influencing Factors, Human Constitution and Physique, Reproductive Biology

*Ecological Anthropology:* Fundamentals of Ecology, Adaptation to Environment, Epidemiological Anthropology

##### **Social Anthropology**

*Introduction to Social Anthropology:* Social Anthropology: Nature and Scope, Philosophical and Historical Foundations of Social Anthropology, Relationship of Social Anthropology with Allied Disciplines

*Society and Culture:* Concept of Society and Culture, Social Groups, Social Identity and Movements, Social Change in Indian Context

*Anthropological Theories:* Classical Theories, Functionalism, Structural Functionalism and Neo-Functionalism, Social Organisation and Dynamic Theories of Structure, Culture and Personality, Marxism, Structuralism, Feminism, Post-Modernism and Post-Colonialism

*Kinship, Marriage and Family:* Kinship, Descent and Alliance Theories, Marriage, Family, Kinship, Family and Marriage in India

*Religion: Concepts and Approaches to the Study of Religion, Rituals and Symbolism, Religious Specialists*

*Economic and Political Organisations: Concepts and Definitions, State and Stateless Societies: Political Institutions, Production, Consumption and Exchange, Political Power and Distribution of Resources*

**Archaeological Anthropology**

*Introduction to Archaeological Anthropology: Definitions and Scope, History and Development, Interdisciplinary Relations*

*Tool types and techniques in Archaeology: Space, Tool Families, Tool- Technologies, Household and Decorative Objects*

*Geological Framework: Time and Space, Recent Period, Human Palaeontology*

*Dating Methods: Relevance of Dating, Relative and Absolute dating*

*Lithic Cultures: Palaeolithic, Mesolithic and Neolithic. Evidence of palaeolithic culture in India*

*Indus valley civilization.*

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## **2. PhD in Economics (PHDEC)**

The syllabus includes topics from Microeconomics, Macroeconomics and Research Methodology.

### **Microeconomics**

Consumer Behavior: Theory of Demand, Recent developments of Demand theory

Producer Behavior: Theory of Production, Theory of Cost

Price and Output Determination: Perfect Competition, Monopoly, Monopolistic Competition, Collusive and non-Collusive Oligopoly, Alternative theories of Firm

Welfare Economics: Pigovian vs. Paretian Approach, Social Welfare Function, Externality and Public Goods, Social Choice and Welfare

General Equilibrium

Economics of Uncertainty: Choice in Uncertain Situations, insurance Choice and Risk

Game Theory: Cooperative and non- Cooperative games

### **Macroeconomics**

Classical and Keynesian Approaches, neoclassical Synthesis, Economic Growth- Solow Model, Endogenous Growth Model, Rational Expectations,

Inter-temporal decision-making- Ramsey Model, Overlapping generations Model, Money and the Role of Monetary Policy,

Business Cycles- Traditional Theories, Real Business Cycles

Unemployment- Traditional Theories, Search Theory, Nominal and Real Rigidities, New Keynesian Theories of Unemployment

Open-Economy: Flexible and Fixed Exchange Rate Systems, Sluggish Price Adjustment

### **Research Methodology**

Approaches to Social Enquiry, Research Process, Hypothesis: Its Types and Sources, The Nature, Sources and Types of Data, Measurement Scales of Variables

Descriptive Statistics and Data Presentation, Correlation and Regression, Probability and Probability Distributions

Sampling Theory- Sampling Distribution, Statistical Inference

Measurement of Inequality, Construction of Composite Index

Introduction to Differential Calculus- Functions, Limit and Continuity, Differential Calculus  
Partial and Total Differentiation

Extreme Values and Optimisation- maxima and Minima, Unconstrained Optimisation,  
Constrained Optimisation

Integral Calculus and Economic Dynamics: Integration and Applications of Economic  
Dynamics, Difference Equations and Economic Dynamics

Linear Algebra and Economics Applications- Vectors and Matrices, Input-Output Analysis,  
Linear Programming.

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### **3. PhD in Library & Information Science (PHDLIS)**

#### **Section - A**

##### **1. Introduction to Research Methodology**

- Fundamentals of research
- Types of research
- Research methods – quantitative and qualitative
- Research Tools,
- Research design
- Ethical issues in research (IPR, plagiarism)
- Research Communication (report writing, style manuals, web enabled citation management tools)
- Methods and techniques of Reviewing (book review, literature review,

#### **Section – B**

1. Information, Communication and Society
2. Information Sources, Systems and Services
3. Information Processing and Retrieval
4. ICT Applications
5. Recent Trends in LIS

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#### **4. PhD in Political Science (PHDPS)**

##### **I Research Methodology**

Methodology/Framework: Systems, Marxian and Post–Modern approaches, Inter–  
Disciplinary approach

Research Methods: Research Design-Research Proposal, Review of Literature,  
Hypothesis/Research

Questions, Analysis and Interpretation of Data.

##### **II. Political Theory & Thought**

Introduction to Political Theory: Meaning, nature and scope of political theory,  
Approaches– Normative, Historical and Empirical, Perspectives– Feminist and Post–  
modern Concepts: Liberty, Equality and Justice, Citizenship, Civil Society Indian and  
Western Political Thought: Thinkers and Themes Contemporary Debates: Human Rights,  
Multiculturalism, Environment & Sustainable Development

##### **III. India: State and Society**

Introduction: State, Society and Politics Interface (Conceptual and Theoretical Aspects)

Working of the Indian Constitution

Indian State: India's Political Economy, Nature of the Indian State, Models of  
Development, Development in India- Regional Variations

Social Movements: Identity-Based Movements: Caste, Religion, Gender, Tribe, Region,  
Class Movements: Farmers and Working Classes

Democracy in India: Electoral Democracy (Methodology, Issues and Debates)

##### **IV. Globalization and International Relations**

Major theories of IR International Peace and Cooperation: National Sovereignty and  
Humanitarian Intervention, Human

Security and Human Development Agenda, Environment and Sustainability

India in the Emerging World Order: India's Neighborhood, India and Great Powers, India  
and the Developing World

International Political Economy: Trade and Finance, Globalization: Mechanisms and  
Forums International Institutions, Regimes and Orders: International Governance-Issues  
and Mechanisms, Regional Economic Groupings International Civil Society and Non-  
State Actors in IR

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## 5. PhD in Psychology (PHDPC)

The syllabus is based on what is covered at the Master's level in psychology. The outline of syllabus is as follows:

### 1. Research Methodology (50%)

Introduction to research in psychology, definition, constructs and variables, steps in psychological research, problem and hypothesis, type 1 and type 2 errors; Types of research: experimental, non experimental, field experiments, field studies, survey research; Research designs; Methods of data collection including interview, observation, objective tests, questionnaire; Test Construction; Reliability and validity; Sampling and sampling techniques; Qualitative and quantitative approach to research; Methods of data collection in qualitative research; Ethics in research; Psychological statistics, levels of measurement, descriptive and inferential statistics, measures of central tendency and measures of variability; Correlation and Regression; Parametric and nonparametric statistics and their various techniques for statistical analysis; Normal Distribution Curve.

### 2. Specialisation (50%)

#### **A: Industrial and Organisational Psychology**

Introduction to industrial and organisational psychology; Human resource management and human resource development; Recruitment and Selection; Training and training methods; Performance appraisal; Leadership; Diversity and diversity management; Accidents and Industrial safety; Workplace behaviour and ethical issues; Workplace violence and harassment; Conflict and conflict management; Motivation and theories of motivation; Personality and Attitude in the context of organization; Job Satisfaction; Team, team work and team building; Organisational Behaviour and Organisational development, Organisational Change, Organisational culture and climate; Management by objectives; Organisational citizenship behaviour; Corporate social responsibility; Stress and Stress management.

#### **B: Counselling Psychology**

Introduction to counselling, guidance and psychotherapy; Career counselling and guidance; Stages of counselling and counselling relationship; Counselling with regard to various

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developmental stages; Counselling for persons with HIV/ AIDS, Cancer and other terminal illnesses; Assessment in Counselling; School counselling

Multicultural counselling; Learning Disability; Behavioural problems of children; Eating Disorders; Substance abuse; Anxiety Disorder; Art, Drama and Play therapy; Psychotherapies; Family counselling; Ethics in Counselling

**AND**

**C: Clinical Psychology**

Concept of Abnormality, paradigms and perspectives of psychopathology; Personality and Personality disorders; Schizophrenia; Mood disorders; Eating Disorders; Anxiety and Anxiety Disorders; Psychosomatic disorders; Substance abuse; Prevention of mental disorders; Diagnosis and tools for diagnosis including case history, Mental Status Examination, intelligence assessment, personality assessment, DSM V; Introduction to Psychotherapy, Psychoanalysis, Behaviour therapy, Humanistic and Existential therapy, Person centered therapy, Gestalt therapy, Cognitive therapy, Cognitive Behaviour therapy; Psychotherapeutic relation; Play therapy, Narrative therapy; Family therapy; Ethical issues.

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## 6. PhD in Public Administration (PHDPA)

### SECTION-I (Public Administration)

- Public Administration—Meaning, Nature and Scope, Changing Complexion of Public Administration in Globalisation era, New Public Administration, New Public Management, New Public Service, Governance, Civil Society.
- Administrative Thinkers—Kautilya, Woodrow Wilson, Luther Gullick and Lyndall Urwick, Max Weber, F.W. Taylor, Henry Fayol, M.P. Follet, Elton Mayo, Chester Barnard, Herbert Simon, D.H. McGregor, Abraham Maslow, Frederick Herzberg and Chirs Argyris.
- Indian Administration—Organisation of the Union Government—Central Secretariat, Ministries and Departments, Cabinet Secretariat, Prime Minister’s Office, Constitutional bodies and Commissions, Regulatory Agencies, NITI Aayog.
- Organisation of the State Government—Secretariat, Role of Chief Secretary, Organisaton of Departments and Directorates.
- Personnel Administration— Bureaucracy, Classification of Services, Recruitment, Recruitment Agencies—Union Public Service Commission, State Public Service Commission, Training, Promotion, Performance Appraisal, Discipline, Morale, Staff Associations, Employer-Employee Relations, Pay Commissions.
- Financial Administration----Budget, Types of Budget, Enactment and Execution of Budget, Parliamentary Committees, Parliamentary Control over Public Expenditure, Audit, Role of Comptroller and Auditor General of India.
- Local government— Nature and Scope, 73<sup>rd</sup> and 74<sup>th</sup> Constitutional Amendments in India, Urban and Rural local bodies-Organisation and Functions, Finance, Committee

System, State and Local Government Relations and Challenges of Local Self-Government.

- Disaster Management, Sustainable Development, Social Audit, Corporate Governance, Corporate Social Responsibility, and Contemporary Issues in Governance.

## **Section II Research Methodology**

- Meaning, Objectives and Types of Research
- Research Ethics
- Research Methods versus Research Methodology
- Research Methods in Social Sciences
- Research Design
- Hypotheses
- Methods of Data Collection
- Sampling Design
- Data Processing and Analysis
- Report Writing

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## 7. PhD in Sociology (PHDSOC)

### Section - A

#### 1. Research Methodology

- Logic of enquiry in social research
- Logic of Theory Building
- Issues of epistemology
- Positivism and its critique
- Comparative Method
- Feminist Method
- Participatory Method

#### 2. Research Methods and Research Design

- Types of Research
- Methods of Research
- Research Design
- Techniques of Data Collections: Sampling, Interview, Case Study, Life History, Observation, Hypothesis, Correlation and regression.

### Section - B

- Sociological concepts: social groups, social structure, community, association, culture, identity, tradition, modernity, social processes, social Institutions- family, marriage, kinship, state, religion
- Sociological Theories: Evolutionary- Functional, Marxian, Structural-Functional, Structural, Symbolic interactionism, Phenomenology, Post-Modernism
- Social stratification-castes, class, race, gender, ethnicity
- Types of societies: colonial, post colonial, simple, agrarian, Industrial, post industrial, knowledge society
- Social change: Theories of social change, social transformation, social movements, social development

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## 8. PhD in Bio-Chemistry (PHDBC)

### **PART-A: Research Methodology, Basic Science and General Aptitude paper:**

Questions will be designed to test basic knowledge of English, Chemistry, Physics, Mathematics and Reasoning and mental ability. They may be designed to test domain knowledge as well as non-verbal reasoning capacity (e.g., by finding the odd one out in a series of abstract pictures). They may also be of quantitative type; designed to test the student's ability to comprehend large numbers and do simple calculations.

Introduction of Research: Meaning and importance, Objectives, Nature and Types of Research, Areas of research in Biological Science.

Research Process, Formulation of a Research Problem (Hypothesis) and Considerations in selecting a Research Problem, Review of Literature, Objectives.

Elements in Research Methodology; Preparing Research Designs, Research Designs [(Completely Randomized Design (CRD), Randomized Block Design (RBD), Latin Square Design (LSD)], Experimental Method, Types of Sample, Tools for Data Collection.

Processing and Analyzing Data, Data Analysis Methods-Qualitative and Quantitative, Reporting the Findings.

Writing of Research Report/Research paper/Thesis; Dissertation: Various components and their organization.

### **PART-B: Subject specific paper**

#### **1) Cell biology:**

Physical structure of model cell membranes in prokaryotes and eukaryotes, lipid bilayer, membrane proteins, other constituents; diffusion, osmosis, active transport, regulation of intracellular transport and electrical properties. Structural organization and functions of nucleus, mitochondria, Golgi bodies, endoplasmic reticulum, lysosomes, Chloroplast, peroxisomes, vacuoles. Cytoskeletons structure and motility function. Organization of genome, structure of chromatin and chromosomes, heterochromatin, euchromatin. Cell division and cell cycle: Mitosis and meiosis, their regulation, Cell cycle and its regulation, apoptosis, necrosis and autophagy. Cell transformation and cancer, oncogenes and proto-oncogenes, tumor suppressor genes, metastasis. Therapeutic interventions of uncontrolled cell growth. 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 systems, light signaling in plants, bacterial chemotaxis and quorum sensing. Cellular communication: General principles of cell communication, cell adhesion and roles of different adhesion molecules, tight junctions, communicating junctions, extracellular

matrix, integrins, neurotransmission and its regulation. Regulation of hematopoiesis, differentiation and development.

## 2) **Biomolecules:**

Physical properties of water and their role in biology. Concepts of pH, ionic strength and buffers. Laws of thermodynamics. Concepts of  $\Delta G$ ,  $\Delta H$  and  $\Delta S$ . Structure and functions of amino acids, proteins, nucleic acids, carbohydrates and lipids. Forces that stabilize biomolecules such as electrostatic and van der Waal's interaction, hydrogen bonding. Interactions with solvents, Hydrophobic effect. Structural characteristics of protein in  $\alpha$ -helix,  $\beta$ -sheet and  $\beta$ -turn. Ramachandran plot. Protein domains and domain architecture. Quaternary structure of proteins. General structure of DNA and RNA, Structural characteristics of A, B and Z-DNA. 3D structure of t-RNA, ribozymes and riboswitches. Introduction to enzymes. Types of enzymatic reaction mechanisms, Michaelis-Menten kinetics. Competitive, Non-competitive and Un-competitive inhibition. Bi-substrate reaction kinetics. Concepts of order and molecularity of a chemical reaction. Derivation of first and second order rate equation, measurement of rate constants. Concept of activation energy. Structure and biological significance of vitamins and minerals

### 3) Physiology

Photosynthesis- Light harvesting complexes; mechanisms of electron transport; photoprotective mechanism; CO<sub>2</sub> fixation-C<sub>3</sub>, C<sub>4</sub> and CAM pathway. Nitrogen fixation: Historical background, nitrogen cycle in nature, symbiotic nitrogen fixation, nitrogenase system, nitrate reductase. Plant nutrition, water relations, phytochromes, calmodulin, circadian rhythms, plant hormones- Biosynthesis, storage, breakdown and transport; physiological effects and mechanisms of action. Blood and circulation- Blood corpuscles, haematopoiesis and formed elements, plasma function, blood volume, blood volume regulation, blood groups, haemoglobin, immunity, haemostasis. Cardiovascular System- anatomy of heart structure, myogenic heart, cardiac cycle, heart as a pump, blood pressure, neural and chemical regulation. Respiratory system – transport of gases and exchange of gases, waste elimination. Digestive system – Digestion, absorption, energy balance, BMR. Excretory system- Physiology of excretion, kidney, urine formation, urine concentration, waste elimination, micturition. Regulation of water balance, blood volume, blood pressure, electrolyte balance, acid-base balance. Nervous system- Neurons, action potential, central and peripheral nervous system. Sense organs- Vision, hearing and tactile response. Reproduction- Reproductive processes, gametogenesis, ovulation.

## 4) **Molecular biology and Recombinant DNA technology:**

Genes and chromosomes, Operon concept, DNA replication, DNA damage and repair mechanisms, homologous and site-specific recombination. Transcription of various types of RNAs and their processing and modifications. Transcription factors and machinery including RNA polymerases, formation of initiation complex, elongation and termination of transcription. Regulation of transcription: activators (enhancers) and repressors, Locus

control regions. Protein synthesis, processing and transport of proteins: Ribosome, mRNA structure, genetic code, aminoacylation of tRNA, aminoacyl tRNA synthetase. Mechanism of translation: Initiation, elongation and termination factors and translational proof-reading. Regulation of Translation- global vs mRNA-specific. Inhibitors of Translation , Posttranslational modifications of proteins. Protein trafficking and transport. Regulation of gene expression in prokaryotes and eukaryotes, role of chromatin, chromatin remodelling and gene silencing, Epigenetic regulation. Enzymes used in Recombinant DNA technology. Isolation and purification of DNA (genomic and plasmid) and RNA. Various methods of separation, characterization of nucleic acids including Southern and Northern hybridizations. Molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems. Expression of recombinant proteins using bacterial, animal and plant vectors and their purification. Western blotting. Generation of genomic and cDNA libraries. Plasmid, phage, cosmid, BAC and YAC vectors. In vitro mutagenesis and deletion techniques, gene knock out in bacterial and eukaryotic organisms. Isolation and amplification of specific nucleic acid sequences, PCR, RT PCR and qRT PCR, DNA sequencing methods, strategies for genome sequencing. Methods for analysis of gene expression at RNA and protein level, large scale expression, such as micro array based techniques. Analysis of DNA polymorphism: RFLP, RAPD and AFLP techniques.

#### **5) Microbiology and Immunology :**

Cell structure and components, characterization and classification of microorganisms. Cultivation of Bacteria, nutrition, physiology and growth of microbial cells, reproduction and growth, synchronous growth, continuous culture of microorganisms. Pure cultures and their characteristics. Fundamentals of control of microbial growth control by physical and biochemical agents. Production of mutants by chemical and physical agents and their characterizations. Host microbe interactions, endotoxins, exotoxins, capsular material. Enzymatic and other factors, tissue affinity, resistance and immunity. Viruses of bacteria, plant and animal cells: Structure, classification and life cycle, mycoplasma and virioids, diseases. 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, congenital and acquired immunodeficiencies, vaccines. Host-pathogen interaction- Recognition and entry processes of different pathogens like bacteria, viruses and protozoans 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.

#### **6) Tools and Techniques used in Biological research:**

Concepts of precision and accuracy in experimental measurements. Concept of signal to noise ratio. Biostatistics: Measures of Central Tendency. Fundamental ideas of probability and probability distributions: Binomial, Poisson and Gaussian distributions. Concept of the Central Limit Theorem. Hypothesis testing: Use of Student's t and  $\chi^2$  tests. Correlation and regression. Basic concepts of design of Experiments. Biochemical Methods: Chromatography: Ion exchange, Gel Filtration and Affinity chromatography. Electrophoresis: Native and SDS-PAGE. Isoelectric focusing. 2D-PAGE and its applications. UV/Vis spectrophotometry. Beer-Lambert's law and its use in determination of protein/ nucleic acid concentration. Fluorescence Spectroscopy: Basic concepts of excitation and emission. Quenching, Theory and applications of FRET and fluorescence lifetime measurements. Fundamentals of CD, IR and Raman spectroscopy and their use in the study of biomolecular conformation. Centrifugation: Basic concepts of centrifugation. Density gradient centrifugation. Sedimentation velocity and Sedimentation equilibrium. Separation of sub-cellular components and macromolecules using high speed and ultracentrifugation. Microscopy: Bright field, phase contrast, fluorescence, confocal, and electron microscopy. Fundamentals of X-ray, NMR and cryo-electron microscopy for determination of biomolecular structure.

**7) Genetics and Evolution Chromosomal inheritance:** Principles of Mendelian inheritance, codominance, incomplete dominance, gene interactions, pleiotropy, genomic imprinting, linkage and cross-over, sex-linked inheritance, Population Genetics and Hardy-Weinberg equilibrium. Extrachromosomal inheritance: Maternal inheritance (mitochondria and chloroplast) Gene concept: Allele, multiple alleles, pseudoalleles. Genetic analysis: Linkage maps, mapping with molecular markers, tetrad analysis, gene transfer in bacteria: transformation, conjugation, transduction. Mutation: Spontaneous, induced, lethal, conditional, reversion, mutagenic suppression, germinal and somatic mutation, insertion, deletion, duplication, translocation, transposition, ploidy. Species concept in archaea, bacteria and eukarya. Phylogenetic analysis and evolutionary relationship among taxa, MLST.

**8) Genomics and Proteomics Introduction to Genomics:** Structure and organization of prokaryotic and eukaryotic genomes - nuclear, mitochondrial and chloroplast genomes; Computational analysis of sequences- finding genes and regulatory regions; Gene annotation; Similarity searches; Pairwise and multiple alignments; Alignment statistics; Prediction of gene function using homology, context, structures, networks; Genetic variation, polymorphism, deleterious mutation; Phylogenetics; Tools for genome analysis- PCR, RFLP, DNA fingerprinting, RAPD, Automated DNA sequencing; Linkage and pedigree analysis; Construction of genetic maps; Physical maps, FISH to identify chromosome landmarks. Human genome project-landmarks on chromosomes



generated by various mapping methods; BAC libraries and shotgun libraries preparation; Physical map-cytogenetic map, contig map, restriction map, DNA sequence; DNA sequencing and sequence assembly; Model organisms and other genome projects; Comparative genomics of relevant organisms such as pathogens and nonpathogens; Evolution of a pathogen. Taxonomic classification of organisms using molecular markers -16S rRNA typing/sequencing. DNA Microarray technology, cDNA and oligonucleotide arrays; Applications: Global gene expression analysis, Comparative transcriptomics, Differential gene expression; Genotyping/SNP detection; Detection technology; Computational analysis of microarray data. Proteomics: Outline of a typical proteomics experiment; Identification and analysis of proteins by 2D analysis; Spot visualization and picking; Tryptic digestion of protein and peptide fingerprinting; Mass spectrometry; ion source (MALDI, spray sources); analyzer (ToF, quadrupole, quadrupole ion trap) and detector; clinical proteomics and disease biomarkers; Prions; proteins in disease; Protein-protein interactions: Solid phase ELISA, pull-down assays (using GST-tagged protein), far western analysis, by surface plasmon resonance technique, Yeast two hybrid system, Phage display; Protein interaction maps; Protein arrays-definition, applications- diagnostics, expression profiling.

**9) Metabolism Metabolic concepts:** Introduction to metabolic concepts. Gibbs free energy, Laws of thermodynamics, High energy compounds, Phosphoryl transferase, oxidative phosphorylation and generation of ATP, chemiosmotic theory. Carbohydrate metabolism: Pathways involved in carbohydrate metabolism such as Glycolysis, Citric acid cycle, Gluconeogenesis, Cori cycle, HMP shunt pathway, Glycogenesis and Glycogenolysis with reference to their regulation and energetic. Amino acid metabolism: Deamination, transamination, decarboxylation, desulphuration, Ketogenic and glucogenic amino acids. Urea cycle, Regulation of amino acid biosynthesis Lipid metabolism: Energetics of fatty acid degradation. Fatty acid biosynthesis. Cholesterol metabolism and its regulations. Regulation of blood cholesterol, triglycerides, LDL and HDL. Nuclei Acid Metabolism: Synthesis and degradation of purines and pyrimidines and their regulation. Integration of metabolic pathways, metabolism of Xenobiotics.

**10) Clinical biochemistry:** Specimen collection and analysis, Concepts of accuracy, precision, reproducibility, reliability, and other factors in quality control. Normal values. Specimen collection and Processing: Collection of blood - venipuncture, skin puncture, arterial puncture. Anticoagulants. Collection and analysis of normal and abnormal urine - timed urine specimens, preservatives. Clinical significance of sugars, proteins, ketone bodies, bilirubin and porphyrins. CSF - collection, composition and analysis. Amniotic fluid - Origin, collection, composition. Disorders of carbohydrate, lipid and protein metabolism : Salient features and management of disorders related to carbohydrate, lipid and protein metabolism and their diagnostics. Disorders of carbohydrate metabolism - glucose tolerance test, Glycogen storage diseases. Disorders of lipid metabolism - fatty liver, obesity, atherosclerosis. Disorders of protein metabolism - Haemoglobinopathies -

sickle cell anaemia, thalassemia and erythrocyte enzyme disorders. Inborn errors of metabolism- Phenylketonuria, alkaptonuria. Serum enzyme activities in diseases - Principle and assay of aspartate aminotransferase, alanine aminotransferase, alkaline phosphatase, acid phosphatase, streptokinase, asparaginase,  $\alpha$ -hydroxybutyrate dehydrogenase, ceruloplasmin,  $\gamma$ -glutamyl transpeptidase, creatine kinase and lactate dehydrogenase. Enzyme and isoenzyme as diagnostic tool, method for isoenzyme analysis. Organ and organ function tests: Normal structure and functions of liver, diseases of the liver, hepatitis types, cirrhosis, alcoholic liver disease, hepatic tumor and biliary tract diseases, liver function tests, disorders of bilirubin metabolism. Renal function tests and related disorders: Acute and chronic renal failure, urinary tract obstruction and analysis of urinary calculi.

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## 9. PhD in Chemistry (PHDCHEM)

### PART A

#### RESEARCH METHODOLOGY

1. Objectives of research
2. Research methods versus Research Methodology
3. Types of research: • Descriptive versus Analytical; • Applied versus Fundamental; • Quantitative versus Qualitative; • Conceptual versus Empirical
4. Literature Review: Methods and Importance
5. Research design: Need, Types and Features of research design
6. Formulating Research Problem
7. Collection and analysis of Data: Importance and Methods of data collection,
8. Data Analysis with Statistical Packages
9. Ethical issues in Research: Copyright, Intellectual Property Rights; Plagiarism

### PART B

#### I: Inorganic Chemistry

1. Chemical periodicity
2. Structure and bonding in homo- and heteronuclear molecules, including shapes of molecules (VSEPR Theory).
3. Concepts of acids and bases: Hard-Soft acid base concept, Non-aqueous solvents.
4. Main group elements and their compounds: Allotropy, synthesis, structure and bonding, industrial importance of the compounds.
5. Transition elements and coordination compounds: structure, bonding theories, spectral and magnetic properties, reaction mechanisms.
6. Inner transition elements: spectral and magnetic properties, redox chemistry, analytical applications.
7. Organometallic compounds: synthesis, bonding and structure, and reactivity. Organometallics in homogeneous catalysis.
8. Cages and metal clusters.
9. Analytical chemistry- separation, spectroscopic, electro- and thermoanalytical methods.
10. Bioinorganic chemistry: photosystems, porphyrins, metalloenzymes, oxygen transport, electron- transfer reactions; nitrogen fixation, metal complexes in medicine.
11. Characterisation of inorganic compounds by IR, Raman, NMR, EPR, Mössbauer, UV-VIS, NQR, MS, electron spectroscopy and microscopic techniques.
12. Nuclear chemistry: nuclear reactions, fission and fusion, radio-analytical techniques and activation analysis.

## **II: Physical Chemistry**

1. Basic principles of quantum mechanics: Postulates; operator algebra; Model systems: particle-in-a-box, harmonic oscillator; Hydrogen atom, including shapes of atomic orbitals; orbital and spin angular momenta; tunneling.
2. Approximate methods of quantum mechanics: Variation principle; perturbation theory up to second order in energy; applications.
3. Atomic structure and spectroscopy: term symbols; many-electron systems and antisymmetry principle.
4. Chemical bonding: Elementary aspects of MO and VB theories; Huckel theory for conjugated  $\pi$ -electron systems.
5. Chemical applications of group theory: symmetry elements; point groups; character tables; selection rules.
6. Molecular spectroscopy: Rotational and vibrational spectra of diatomic molecules; electronic spectra; IR and Raman activities – selection rules; basic principles of magnetic resonance.
7. Chemical thermodynamics: Laws, state and path functions and their applications; thermodynamic description of various types of processes; Maxwell's relations; spontaneity and equilibria; temperature and pressure dependence of thermodynamic quantities; Le Chatelier principle; elementary description of phase transitions; phase equilibria and phase rule; thermodynamics of ideal and non-ideal gases, and solutions.
8. Statistical thermodynamics: Boltzmann distribution; kinetic theory of gases; partition functions and their relation to thermodynamic quantities – calculations for model systems.
9. Electrochemistry: Nernst equation, redox systems, electrochemical cells; DebyeHuckel theory; electrolytic conductance – Kohlrausch's law and its applications; ionic equilibria; conductometric and potentiometric titrations.
10. Chemical kinetics: Empirical rate laws and temperature dependence; complex ; steady state approximation; determination of reaction mechanisms; collision and transition state theories of rate constants; unimolecular reactions; enzyme kinetics; salt effects; homogeneous catalysis; photochemical reactions.
11. Colloids and surfaces: Stability and properties of colloids; isotherms and surface area; heterogeneous catalysis.
12. Solid state: Crystal structures; Bragg's law and applications; band structure of solids.
13. Polymer chemistry: Molar masses; kinetics of polymerization.
14. Data analysis: Mean and standard deviation; absolute and relative errors; linear regression; covariance and correlation coefficient.

### III. Organic Chemistry

1. IUPAC nomenclature of organic molecules including regio- and stereoisomers.
2. Principles of stereochemistry: Configurational and conformational isomerism in acyclic and cyclic compounds; stereogenicity, stereoselectivity, enantioselectivity, diastereoselectivity and asymmetric induction.
3. Aromaticity: Benzenoid and non-benzenoid compounds – generation and reactions.
4. Organic reactive intermediates: Generation, stability and reactivity of carbocations, carbanions, free radicals, carbenes, benzyne and nitrenes.
5. Organic reaction mechanisms involving addition, elimination and substitution reactions with electrophilic, nucleophilic or radical species. Determination of reaction pathways.
6. Common named reactions and rearrangements – applications in organic synthesis.
7. Organic transformations and reagents: Functional group interconversion including oxidations and reductions; common catalysts and reagents (organic, inorganic, organometallic and enzymatic). Chemo, regio and stereoselective transformations.
8. Concepts in organic synthesis: Retrosynthesis, disconnection, synthons, linear and convergent synthesis, umpolung of reactivity and protecting groups.
9. Asymmetric synthesis: Chiral auxiliaries, methods of asymmetric induction – substrate, reagent and catalyst controlled reactions; determination of enantiomeric and diastereomeric excess; enantio-discrimination. Resolution – optical and kinetic.
10. Pericyclic reactions: electrocycloisatation, cycloaddition, sigmatropic rearrangements and other related concerted reactions. Principles and applications of photochemical reactions in organic chemistry.
11. Synthesis and reactivity of common heterocyclic compounds containing one or two heteroatoms (O, N, S).
12. Chemistry of natural products: Carbohydrates, proteins and peptides, fatty acids, nucleic acids, terpenes, steroids and alkaloids. Biogenesis of terpenoids and alkaloids.
13. Structure determination of organic compounds by IR, UV-Vis,  $^1\text{H}$  &  $^{13}\text{C}$  NMR and Mass spectroscopic techniques.

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## **10. PhD in Geography (PHDGEOG)**

### **PART - A**

#### **RESEARCH METHODOLOGY**

Objectives of research; Research methods versus Methodology

Types of research: Descriptive vs. Analytical; Applied vs. Fundamental; Quantitative vs. Qualitative; Conceptual vs. Empirical

Literature Review: Methods and Importance

Research design: Need, Types and Features of research design, Formulating Research Problem

Sampling Techniques: Probability and Non-probability sampling

Collection and analysis of Data: Importance and Methods of data collection, Data Analysis with Statistical Packages

Use of Cartography, Remote Sensing, GIS and GPS in Geographical Research

Ethical issues in Research: Copy right, Intellectual Property Rights; Plagiarism

### **PART - B**

#### **GEOGRAPHY**

##### **Unit 1: Geographical Thought**

Geography 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, Dichotomy between Systematic Vs. Regional Geography, Physical Vs. Human Geography, and Determinism Vs. Possibilism; Areal Differentiation and Spatial Organisation, Quantitative Revolution, Impact of Positivism, Humanism, Radicalism and Behaviouralism in Geography.

##### **Unit 2: Geography of India**

Physiography, Climate, Natural Resources: Vegetation, Soils, Water, Coastal and Marine, Mineral and Power; Agriculture, Agro-Climatic Regions, Irrigation, Major Industries and Industrial Regions, Population, Settlement Patterns, Urbanisation, Transport and Communication, Major Geographical Regions of India.

##### **Unit 3: Methods and Techniques in Geography**

**Cartography, Remote Sensing, GIS and GPS:** Map as a Tool in Geographical Studies, Techniques Showing Spatial Patterns of Distribution, Types of Maps: Composite, Choropleth, Isopleth and Chorochromatic; Accessibility and Flow Maps, Cartographic Representation of Data, Computer Applications in Cartography, Symbolisation and Generalisation; Principles of

Remote Sensing, GIS and GPS; EMR, Platforms and Sensors, Elements of Image Interpretation, Components of GIS, Data Structure, Applications of Remote Sensing, GIS and GPS in Geography.

**Statistical Methods:** Data Sources and Types of Data, Statistical Diagrams, Descriptive Statistics, Measures of Central Tendency, Measures of Dispersion, Lorenz Curve and Gini Coefficient, Correlation and Regression, Theory of Probability, Sampling Techniques and Tests of Significance, Scaling: Ranking Method, Normal Distribution and Z-Score.

#### **Unit 4: Physical and Human Geography**

**Geomorphology:** Fundamental Concepts, Endogenic and Exogenic Forces, Geosynclines and Mountain Building, Isostasy, Continental Drift and Plate Tectonics, Denudational Processes: Mass Wasting, Weathering and Erosion; Cycle of Erosion and Evolution of Landscape: Theories of Davis, Penck and King; Fluvial, Glacial, Aeolian, Karst and Coastal Landscapes.

**Climatology and Biogeography:** Composition and Structure of the Atmosphere, Insolation and Heat Budget of the Earth, Temperature, Precipitation, Atmospheric Pressure and General Circulation of Winds, Monsoons and Jet Streams, Stability and Instability of the Atmosphere, Air-Masses, Fronts, Cyclones, Koeppen's and Thornthwaite's Classification of World Climates, Hydrological Cycle, Flood and Drought, Air Pollution, Global Warming, Human Ecosystem, Bio-Diversity, Conservation and Management of Ecosystems.

**Oceanography:** Physical and Chemical Properties of Sea Water: Temperature and Salinity of the Oceans; Origin of Ocean Basins, Bottom Reliefs of Indian, Atlantic and Pacific Oceans, Ocean Deposits, Coral Reefs, Ocean Currents and Tides, Sea-Level Changes.

**Population Geography:** Distribution, Growth and Migration, Sex-Ratio, Literacy, Demographic Transition.

**Settlement Geography:** Site, Situation, Types, Size, Spacing and Internal Morphology of Rural and Urban Settlements, Urban Fringe, City Region, Umland, Settlement Systems, Primate City, Rank-Size Rule, Settlement Hierarchy, Christaller's Central Place Theory.

**Economic Geography:** Recent Approaches in Economic Geography, Location of Economic Activities and Spatial Organisation of Economies; Classification of Economies; Sectors of Economy: Primary, Secondary, Tertiary; Landuse and Landcover, Natural Resources: Renewable and Non-Renewable; Conservation of Resources.

**Agricultural Geography:** Concept and Techniques of Delimitation of Agricultural Regions; Measurement of Agricultural Productivity and Efficiency; Crop Combinations and Diversification; Von Thunen's Model, Agricultural Regions of the World.

**Industrial Geography:** Classification of Industries, Weber's and Losch's Theories of

Industrial Location, Resources-Based and Footloose Industries.

**Geography of Transport and Trade:** Models of Transportation and Transport Cost, Inter-Regional and Intra-Regional Accessibility and Connectivity; Comparative Cost Advantages.

**Political Geography:** Global Strategic Views (Heartland and Rimland Theories), Geopolitics, Concept of Nation, State and Nation-State, Boundaries and Frontiers, Politics of World Resources, Geography and Federalism.

**Social Geography:** Social Structure and Social Processes, Elements of Social Geography, Ethnicity, Tribe and Caste, Concept of Social Well-Being, Environment and Culture, Concept of Culture: Areas and Cultural Regions, Dwelling Places as Cultural Expressions.

**Regional Planning:** Concept of Region, Types of Regions and Methods of Regionalisation, Regional Hierarchy, Regional Planning, Regional Planning in India, Concept of Development, Indicators of Development, Region

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## 11. PhD in Geology (PHDGY)

### Structure:

Section	Name of the Section	Sr. No.	Course Title
A	RESEARCH METHODOLOGY	1	Research Methodology in Geology
B.	DISCIPLINE SPECIFIC COURSES	2	Physical Geology and Geomorphology
		3	Structural Geology and Tectonics
		4	Stratigraphy and Palaeontology
		5	Mineralogy
		6	Petrology
		7	Georesources and Economic Geology
		8	Geochemistry
		9	Applied Geology

### SECTION A. RESEARCH METHODOLOGY

**1. Research Methodology in Geology:** Definition, outcome and importance of geological research; theory and philosophy of research methodology in context to geology; emerging areas and interdisciplinary research in geology;

Identifying and defining research problem; techniques involved in defining research problem and identifying gaps; sources of literature; implications of literature collection and its review.

Preparation and planning for fieldwork; field kit and equipments; safety measures in field; field procedures and precautions taken during sampling; maintenance of field notebook; uses of topographical maps and satellite images; selection of traverses; recognition of geological features, rock types and stratigraphic contacts in field; use of clinometer compass, measurement of dip and strike of strata; measurements of geologic sections; uses of GPS; recording field observations in field notebook; geological mapping.

Data collection; sampling methods; data collection methods in sedimentology, palaeontology, stratigraphy, structural geology and tectonics, mineralogy, petrology, ore geology and hydrogeology; classification and presentation of data; role of statistics and computers in research; use of computer in data processing; methods of communicating and displaying analysed data; applications of Geographic Information System.

Thin section preparation; petrological and palaeontological microscopes; Ore microscopy; SEM microphotography; preparation of samples for geochemical and XRD analysis, heavy mineral separation; construction of lithologs; geophysical exploration methods, remote sensing data.

Intellectual property rights, patents, copyright and related rights; ethics-plagiarism and integrity.

### SECTION B. GEOLOGY COURSES

**2. Physical Geology and Geomorphology:** Composition of the crust and Earth as a whole; basic concepts and significance of geomorphology; relationship between landforms and geomorphic processes- fluvial, aeolian, glacial, and marine; soils; geomorphology of India; applications of geomorphology; mountain building; volcanoes and earthquake; seismic belts of India.

**3. Structural Geology and Tectonics:** Classification of folds and faults; Mechanism of folding; concept of stress and strain and their geological significance; joints and unconformities. concept of plate tectonics; palaeomagnetism, polar wandering and reversal of Earth's magnetic field; sea-floor spreading, island arcs and mountain chains.

**4. Stratigraphy and Palaeontology:** Principles of stratigraphy, time scale and its divisions; stratigraphic classifications; stratigraphic nomenclature; stratigraphic correlation; facies concept in stratigraphy; marine transgression and regression; ice ages; broad stratigraphic subdivisions of India.

Fossil and modes of fossilization; application of fossils in age determination; evolutionary trends and geologic distribution of Brachiopoda, Pelecypoda, Gastropoda, Cephalopoda, Trilobita, Echinoids, Graptolites and Corals; elementary idea about the origin of major groups of vertebrates; evolutionary history of Horse, Elephant and Man; plant life through geologic ages.

**5. Mineralogy:** Physical and optical properties of minerals; classification of minerals; mineralogy of silicates, polymorphism, isomorphism and pseudomorphism; solid solution and exsolution; X-ray crystallography; concept of symmetry; crystallographic classification.

**6. Petrology:** Generation and evolution of magma; Bowen's reaction series; textures and classification of igneous rocks; phase equilibria: single, binary and ternary systems; silicate systems; genesis and tectonic setting of different magma types; cooling and crystallisation of magma.

Sedimentation, lithification and diagenesis; structures and textures; classification of sedimentary rocks; depositional environments; sedimentation and tectonics; heavy minerals and their applications in provenance studies.

Metamorphism and metamorphic processes; metamorphic differentiation; metamorphic facies; types of metamorphism and metamorphic rocks; metasomatism and anatexis.

**7. Georesources and Economic Geology:** Ore genesis; ore localisation and ore shoots; ore dressing and beneficiation; strategic, critical and essential minerals; national mineral policy; economic minerals of India; fossil fuels.

**8. Geochemistry:** Cosmic abundances of elements; geochemical classification and differentiation of the elements; trace element geochemistry; radiogenic and non-radiogenic isotopes; concept of geochemical and biogeochemical cycles and global climates.

### **9. Applied Geology:**

*Engineering Geology:* Engineering properties of rocks; geological investigations, seismic parameters and remedial measures related to the construction of dams, bridges, highways and tunnels; mass movements with special emphasis on landslides and causes of hill slope instability.

*Mineral Exploration:* Principles and methodology of geological prospecting for economic minerals and rocks; sampling methods, methods for estimating reserve and resources, grade and tonnage calculation of the deposits; pathfinder elements; geochemical and geophysical methods; mining in India.

*Hydrogeology:* Hydrological cycle; hydrological properties of rock; distribution of surface and groundwater in the Earth's crust; global water budget; movement of groundwater; aquifers

classification and characteristics; Darcy's law; Theis equation; water table; flow nets; groundwater provinces of India; groundwater quality and pollution; groundwater prospecting; desalination; springs and its types.

*Environmental Geology:* Environment and energy; non-conventional energy resources; geoenvironment; environmental hazards, instrumentation and analysis; disposal of municipal, domestic, hospital, solid and nuclear wastes; oil spills; environmental impact assessment (EIA); environmental legislation: national/international standards; application of remote sensing and GIS in environmental management.

*Remote Sensing and GIS:* Electromagnetic radiation; aerial photographs and their geometry; elements of photo and image interpretation; satellite remote sensing; global and Indian space missions, sensor and their characteristics; digital image processing techniques; geological applications of remote sensing, GIS and GPS.

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## 12. PhD in Statistics (PHDSTAT)

### Part-A: Research Methodology

Meaning of research, Role of research in important areas, Process of research, Types of research, research approach, Significance of research, Research problem: Definition, Selection and necessity of research problem.

Primary and secondary data, Qualitative and quantitative data, Classification of measurement scales, Goodness of measurement scales, Scaling, Scale classification bases, Scaling techniques, Methods of collecting primary data, Merits and demerits of different methods of collecting primary data, Non response, Classification and tabulation of data.

Introduction to sampling, Advantages of sampling over complete enumeration, Probability and non-probability sampling, Sampling and non-sampling errors, Basic concepts of simple random sampling and design of experiments.

Measures of central tendency, Measures of dispersion, Probability distributions (Binomial, Poisson, Normal), Simple correlation and regression, Multiple and partial correlation., Testing of hypothesis (z, t, F and chi-square tests).

### Part-B: Statistics

Sample space, Probability, Conditional probability, Independent events, Bayes theorem, Random variables, Distribution functions (Univariate and Bi-variate), Moments and moment generating function, Independent random variables, Marginal and conditional distributions, Characteristic function, Central limit theorem (i.i.d. case).

Standard discrete (Rectangular, Geometric, Negative binomial, Hyper-geometric) and continuous distributions (Uniform, Exponential, Beta, Gamma), Bivariate normal distribution, Sampling distributions (t, F, z, chi-square).

Properties of good estimators (unbiasedness, Consistency, Efficiency, Sufficiency, Complete and minimal Sufficient statistic), Exponential families, Methods of estimation (least square, maximum likelihood, method of moments, minimum chi-square), Mean square error, Minimum variance unbiased estimators, Rao-Blackwell theorem, Lehmann-Scheffe theorem, Cramer-Rao lower bound,

Basics of testing of hypothesis, Neyman-Pearson lemma, Most powerful and uniformly most powerful tests, Likelihood ratio tests, Unbiased test, Non-parametric tests for one or more

samples problems (Sign, Wilcoxon, Mann-Whitney, Kolmogorov Smirnov, Run , Kruskal Wallies test).

Gauss-Markov theorem, Estimability of parameters in linear models, BLUE.

Markov chains with finite and countable state space, Classification of states, Limiting behavior of n-step transition probabilities, Stationary distribution, Poisson process, Birth-and-death process.

Multivariate normal and its properties, Distribution of quadratic forms, Canonical correlation, Principle components analysis, Factor analysis, Classification and discriminant analysis.

Stratified sampling, Systematic sampling, Probability proportional to size sampling, Ratio, regression and product methods of estimation, Cluster sampling, Multi stage sampling, Two- phase sampling, Successive sampling

Analysis of variance and covariance, Completely randomised designs, Randomised block designs, Latin-square designs, Missing plot techniques, Orthogonality, BIBD,  $2^k$  factorial experiments, Confounding.

Linear programming problem, Simplex methods, Duality, Assignment, Transportation problems, Queuing theory, Steady-state solutions of Markovian queuing models: M/M/1, M/M/1 with limited waiting space, M/M/C, M/M/C with limited waiting space. Elementary inventory models.

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### **13. PhD in Food & Nutritional Science (PHDFN)**

#### **Research Methods and Biostatistics**

Basic Concepts; Formulation of Research Problem; Design Strategies in Research – Descriptive Studies, Analytic Studies, Experimental studies, Intervention trials etc.; Methods of Sampling; Data Collection Tools and Techniques; Presentation and Summarization of Data; Graphical presentation of quantitative data; Measures of Disease Frequency and Association; Reference Values, Health Indicators and Validity of Diagnostic Tests; Measures of Central tendency; Measures of Variability; Measures of Relationship – Correlation, Hypothesis Testing – parametric and non-parametric tests; Proportions, Relative risk, Odds ratio;

#### **Advance Nutrition**

Nutrition: Basic concepts and physiological requirements; Nutritional needs during the life cycle: Dietary Reference Intake: Basic Concept, Energy Requirements, Protein and Amino Acid Requirement, Fat and Fatty Acid Requirements, Fat- Soluble Vitamins and Water- Soluble Vitamins, Minerals; Nutrition through the Life Cycle, Sports Nutrition, Nutrition during Special Conditions – Emergency, High altitude, space mission.

#### **Clinical and Therapeutic Nutrition**

Introduction to diet therapy and therapeutic nutrition; Adaptations of therapeutic diets; Nutritional management of fevers and infections; Nutrition in critical care; Nutritional management of patient with burns, Trauma, sepsis and surgery; Nutritional management of food allergies and food intolerance; Nutrition, diet and cancer; Nutrition care for weight management; Nutritional management of cardiovascular diseases; Nutritional management of metabolic disease; Nutritional management of gastrointestinal tract disorders; Nutritional management in pancreatic, gall bladder and liver diseases; Nutritional management of renal disease; Nutritional management of neurological disorders; Paediatric and geriatric nutrition .

#### **Public Nutrition**

Concept of Public Health Nutrition, Public Nutrition: Multidisciplinary Concept; Nutritional Problems of Public Health Importance – VAD, PEM, Anaemia, IDA, Zinc deficiency and Vitamin D deficiency; Health Economics and Economics of Malnutrition; Food and Nutrition Security; Population Dynamics; Assessment of Nutritional Status in Community Setting Methods and Techniques; Nutrition Monitoring and Surveillance; National Nutrition Policy; Strategies to Combating Public Nutrition Problems; Nutrition Programmes; Programme Management and Administration; Conceptualization and the Process of Nutrition Education, Behaviour Change communication; Nutrition Education Programmes – Formulation, Implementation, Evaluation.

#### **Entrepreneurship and Food Service Management**

History and Development of Food Service System; Planning a Food Service Unit; Setting up a Food Service Unit; Entrepreneurship and Food Service Management; Menu Planning; Food Purchasing and Storage; Quantity Food Production; Food Management: Records and Controls; Delivery and Service - Goals, Styles and Different Systems; Administrative Leadership; Staff Planning and Management; Personnel Functions: Work Productivity; Plant and Equipment Maintenance; Plant – Sanitation and Safety, Food Safety Management Systems: HACCP, risk analysis; Issues in Worker Safety and Security; Issues in Food safety, Standards and Quality control; Food Adulteration, Additives, Contaminants.

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#### **14. PhD in Home Science (PHDHC)**

##### **A. Elective Course: Community Resource Management and Extension (8 Credits)**

Communication for Development (C4D) ICT for Development Gender and Development Corporate Social Responsibility Capacity Building – Training, Advocacy and Development Entrepreneurship and Innovations Programme Management and Development Consumer Studies Sustainable Development – Policies and Programmes Resource Management Extension Education Ergonomics and Design Learning outcomes:

- Building systematic, methodological and comprehensive gain in knowledge in the field of Community Resource Management and Extension.
- Enhancing research skills in the areas of: participatory and innovation communication strategies, resource management, product development; extension management and sustainable development of communities.
- Preparing a cadre of professionals for planning and implementing various programmes in the development sector

##### **B. Compulsory Course: Research Methodology (8 Credits)**

Introduction to Research Ethics in Research Research Methods and Approaches Conceptualization and Research Theory building Research Design – Qualitative and Quantitative Designing Research Proposal Methods of Sampling, Techniques of Data Collection Tool Construction – Reliability, Validity and Standardisation Statistical Methods (including Hypothesis Testing – parametric and non-parametric tests) Data Analysis, Interpretation and Report Writing Scientific Writing and Publishing Learning outcomes: • Developing research competencies in the field of Home Science. • Enhancing analytical abilities and strengthening research through research on community mobilization, participatory development, development communication extension and resource management. • Raising standards of the profession of Home Science through quality research and at the same time promoting responsible citizenship.

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## **15. PhD in Commerce (PHDCOM)**

### **Course 1 : Research Methodology (8 Credits)**

**1. Theory of Research :** Meaning and Definition of Research, Types of Research, Research Approached (Scientific, Historical, Descriptive, Comparative, Institutional), Criteria of Good Research, Research and Business Decisions, Research Applications in Functional Areas of Business.

**2. Research Process :** Problem Selection and Research Design-Selecting a Topic for Research Study, Formulation of Hypothesis, Research Design (Concepts relating to Research Design, Major steps preparing a Research Design, Factors affecting Research Design.)

Techniques of Collecting Qualitative Data (PRA-Participatory Rural Appraisal, RRA - Rapid Rural Appraisal Case Study), Tools of Collecting Qualitative Data (Social Mapping Resource Mapping, Wealth Ranking of the House - holds, Preference Ranking, Focus Group Discussion etc.), Formatting and Processing of Qualitative Data

Sampling Techniques and Sample Design (Methods, Selection of Appropriate Methods and Sampling Criteria), Sampling Tests (Z test, T test, F test). Editing, Coding, Classification and Tabulation Diagrammatic and Graphic Presentation

### **3. Analysis of Data (Statistical Application in Research)**

Statistics and Business Research

Probability Theory

Probability Distributions

Percentages and Ratios

Measures of Central Tendency

Measures of Variability

Correlation and Regression

Measurement of Trend

Association of Attributes

Construction of Indices

Hypothesis Testing

Scaling Technique

**RCO – 002: SPECIALIZATION COURSE (In the selected area of research interest) FOR  
Ph.D./M.Phil**

**Area – 1: Accounting & Taxation**

**ACCOUNTING**

**Contents**

**1. Accounting: Information for Decision Making**

*Accounting Information:* A Means to an End User's Perspective - Types of Accounting Information

*Accounting Information Forms:* - Determining Information Needs - The Cost of Producing Accounting Information, Users of Accounting Information - Objectives of External Financial Reporting - Characteristic of Externally Reported Information - Characteristics and Objectives of Management Accounting Information

*Integrity of Accounting Information:* Institutional Features - Professional Organizations - Competence, Judgment, and Ethical Behavior

*Accounting Systems:* Basic Functions of an Accounting System - Designing and Installation Accounting Systems.

*Careers in Accounting:* Public Accounting - Management Accounting - Governmental Accounting - Education

**2. Presentation and Reporting of Accounting Information**

*Reporting the Results of Operations:* Developing Predictive Information - Reporting Irregular Items Continuing Operations - Discontinued Operations, Extraordinary Items - Changes in Accounting Principles - Earnings per Share (EPS) - Basis and Diluted Earning per Share

**3. Statement of Cash Flows**

*Statement of Cash Flows:* Purpose of the statement - Example of a Statement of Cash Flows - Classification of Cash Flows - The Approach to Preparing a Statement of Cash Flows

*Managing Cash Flows:* Budgeting (The Primary Cash Management Tool - What Priority Should Managers give to Increasing Net Cash Flows?) - Some Strategies for Permanent Improvements in Cash Flow

#### 4. **Financial Statement Analysis**

**Techniques of financial statement Analysis:** Common Size Financial Statements - Financial Statement Analysis Using Common Ratios - Profitability Ratios, Efficiency Ratios, and Solvency Ratios

**Tools of Analysis:** Trend Percentages, Component Percentages, Ratios, Standards of Comparison, Quality of Earnings, Quality of Assets, and the Relative Amount of Debt

**Measures of Liquidity and Credit Risk:** A classified Balance Sheet - Working Capital - Current Ratio, Quick Ratio, Debt Ratio - Evaluating Financial Ratios – Liquidity, Credit Risk, and the Law

#### 5. **Accounting Standards**

Introduction – Accounting Standards in India – Importance of the Accounting Standards – Disclosure of Accounting Policies – Regulations for Valuation of Inventories – Rules for Cash Flow Statement – Norms for Events after Balance Sheet Date – Rules for Provisions and Contingencies – Norms for Net Income and Changes in Accounting Policies – Regulations for Depreciation Accounting – Norms for Revenue Recognition – Accounting for Fixed Assets – Accounting for Taxes on Income – Accounting for Intangible Assets – Norms for Consolidated Financial Statements – Need for Notes to Accounts – Other Accounting Standards – Computerization of Accounts – Indian Companies Providing their Accounts as per US GAAP and IFRS

#### 6. **Global Business and Accounting**

Environmental Forces Shaping Globalization - Political and Legal Systems, Economic Systems, Culture, Technology and Infrastructure - Harmonization of Financial Reporting Standards

**Foreign Currencies and Exchange Rates:** Exchange Rates - Accounting for Transactions with Foreign Companies - Currency Fluctuations – Who Wins and Who Loses? - Consolidated Financial Statements That Include Foreign Subsidiaries

#### 7. **Management Accounting**

An overview – Concepts and uses - Management Accounting Decision Making Authority - Management Accounting's Role in Decision Making - Management Accounting's Role in Performance Evaluation and Rewards

#### 8. **Costing System and Analysis**

**Activity Based Costing System:** Introduction - Traditional manufacturing Costing System - Activity Based Costing (ABC) and Activity Based Management (ABM) System - Cost of Resource Capacity - ABC for Marketing, Selling and Distribution Expenses - ABC for Service Companies

**Cost variance Analysis:** Introduction – Material Variances – Labour Variances – Overhead Variances – Standard Cost Accounting

**Revenue and Profit Variance Analysis:** Introduction - Sales Variances - Profit Variances - Actual Profit and Budgeted: Reconciliation - Variance Reporting - Disposition of Variances

## 9. Responsibility Accounting

Introduction – Meaning and Objectives – Types of Responsibility Centres

### **Reference text books:**

1. Williams, Haka, Bettner (2005) Financial & Managerial Accounting, the basis for business decisions, Tata McGraw-Hill, New Delhi.
2. M. Y. Khan, P. K. Jain (2007) Management Accounting, Text, Problems and Cases, The McGraw-Hill, New Delhi.
3. Asish K. Bhattacharyya (2006) Financial Accounting for Business Managers, Printice-Hall of India Pvt. Ltd., New Delhi.
4. Robert N Anthony, David F. Hawkins, Kenneth A Merchant (2007) Accounting Text and Cases, Tata McGraw-Hill, New Delhi.
5. N. Ramachandran, Ram Kumar Kakani (2008), Financial Accounting for Management, Tata McGraw-Hill, New Delhi.
6. Shashi K. Gupta (2002), Contemporary Issues in Accounting, Kalyani Publishers, New Delhi.
7. Aggarwal, M.P. (1981), Analysis of Financial Statements, National Publishing House, New Delhi.
8. S.N. Maheshwari (2004), Management Accounting and Financial Control, Sultan Chand and Sons, New Delhi.
9. S.N. Maheshwari, S.K. Maheshwari (2006), Corporate Accounting, Vikas Publishing House Pvt. Ltd. New Delhi.

## **Taxation**

### **Direct Taxation – Law and Practice**

1. **General Framework of Direct Taxation in India:** Different direct tax laws and their inter-relationship; Importance of Income Tax Act and Annual Finance Bill Relevant Constitutional provisions; harmonization of tax regime.
2. **Tax Planning:** Concept of tax planning; Tax planning with reference to setting up a new business; locational aspects; nature of business; tax holiday, etc. - Tax planning with regard to specific management decisions such as mergers and takeovers; location of undertaking; introduction of voluntary retirement; tax planning with reference to financial management decisions such as borrowing or investment decision; reorganization or restructuring of capital decisions - Tax planning with respect to corporate reorganization; tax planning with reference to employees' remuneration - Tax Planning vis-à-vis important provisions of wealth-tax including court rulings and legislative amendments.

3. **Tax Management:** Return and procedure for assessment; special procedure for assessment of search cases, e-commerce transactions, liability in special cases; collection and recovery of tax; refunds, appeals and revisions; penalties imposable, offences and prosecution.

### **Indirect Taxation – Law and Practice**

4. **Indirect Taxes:** Special features of indirect tax levies – all pervasive nature, contribution to Government revenues; constitutional provisions authorizing the levy and collection of duties of central excise, customs, service tax, central sales tax and VAT.
5. **Central Excise:** Basis of chargeability of duties of central excise –goods, manufacture, classification and valuation of excisable goods, assessment procedure, exemption, payment, recovery and refunds of duties. Clearance of excisable goods; Central Excise Bonds; maintenance of accounts and records and filing of returns. CENVAT; Duties payable by small scale units. Set-off of duties –concept, meaning and scheme; Central Excise Concessions on exports; search, seizure and investigation; offences and penalty.
6. **Custom:** Levy of and exemption from, customs duties – specific issues and case studies; assessment and payment duties; recovery and refund of customs duties; drawback of duties; Confiscation of goods and conveyances and imposition of penalties; search, seizure and arrest, offence and prosecution provisions - Adjudication, Appeal and Revision; Settlement of Cases.
7. **Service Tax:** Introduction; Genesis of service tax in India; Constitutional Provisions; Definition of service; Education Cess and Secondary and Higher Education Cess
8. **Tax Planning and Management:** Tax Planning, Tax Management, Tax Avoidance and Tax Evasion

### **Reference text books:**

1. Dr. Vinod Kumar Singhania & Dr. Monica Singhania, (2014), Direct Taxes Planning and Management, Taxmann, New Delhi
2. Dr. Vinod Kumar Singhania & Dr. Monica Singhania, (2014), Income Tax including Central Sales Tax, Taxmann, New Delhi
3. R.K. Jain, (2014), Income Tax Planning & Management, Sahitya Bhawan, Agra
4. Dr. P.K. Jain & R.K Tyagi, (2014), Income Tax law & accounts, Sanjay Sahitya Bhawan, Agra
5. R.K. Jain (2014) Excise Customs and Service Tax Case References, Jain Book Depot, New Delhi.

### **Area 2 – International Business**

1. **Basics of International Business Environment** – Social, Cultural, Economic, Political, Demographic, Ecological and Legal Environment.
2. **Balance of Payments** – Concept, Balance of Payments Accounting, Deficit and Surplus, Factors affecting Balance of Payments and Equilibrium and Disequilibrium of Balance of Payments. India's Balance of Payments.

3. **Government Influence on Trade** – Rationale for government intervention, Tariff and Non tariff barriers. Impact of tariff and non tariff barriers on international trade.
4. **Cross Cultural Management** – Hofstede and other studies related to Cross Cultural Management
5. **Introduction to Globalization** – Concept, Major forces, Effects of Globalization on the world economy and developing countries, Globalization strategies of Indian Companies, Cross border Mergers and Acquisitions
6. **International Investment** – Concept, Types of International Investment, FDI and Developing Countries, Determinants of FDI, Recent Trends in FDI flows, Trade Related Investment Measures, Multilateral Investment Agreements.
7. **Transnational Corporations** – Features of Transnational Corporations, Recent Trends in Transnational Corporations, Issues And Controversies Of Transnational Corporations. TNCs and Developing Countries.
8. **Technology Transfer** – Rationale of Transfer of Technology, Recent Trends and Current Issues, Non Equity Forms of Technology Transfer, Intellectual Property Rights, India and Transfer of Technology – strategies and challenges.
9. **World Trade** – Recent Trends - composition and direction, Problems of Developing Countries.
10. **International Trade in Services** – Role of Trade in Services in Economic Development, Composition and Direction of International Trade in Services, Challenges of International Trade in Services.
11. **Multilateral Trading System** – Functions and Structure of WTO, Multilateral Trade Agreement and Plurilateral Trade Agreement, India and WTO. Recent issues related to Multilateral Agreements. Impact of Multilateral Trading System on World Trade.
12. **Regional Economic Groupings** – Forms of Regional Groupings, Rationale and Impact of Regional Economic Groupings, Major Regional Economic Groupings - European Union (EU), North American Free Trade Agreement (NAFTA), Association of South etc. East Asian Nations (ASEAN), South Asian Association for Regional Corporation (SAARC)
13. **International Product Planning** – Product Decision, International Product Life Cycle, New Product Development. Product diffusion.
14. **International Branding and Packaging** – Objectives and Advantages, Brand Familiarity Levels, Branding Strategies , Local Brand Vs Global Brand, Impact of Brands

on Buying Behaviour, Scope for Indian Brands, Functions and Importance of Packaging, Factors Influencing Packaging Decision, Special Considerations in International Marketing.

- 15. International Pricing** – Objectives and factors affecting Pricing Decisions, Pricing Methods and Practices in International Marketing, Transfer Pricing, Counter Trade and Pricing Issues.
- 16. International Distribution** – International Channel System, Types of Intermediaries, Factors affecting Channel Choice, Selecting Overseas Agents.
- 17. International Marketing Communication** – Promotion Mix, Objectives and Role of International Marketing Communication, Key Issues in International Marketing Communication, Major Marketing Promotion Tools.
- 18. International Advertising** – Rationale for International Advertising, Adaptation Vs Standardization, Advertising Appeals and Product Characteristics, Impact of Advertising on buying decisions, Global Media Decisions, Selecting Advertising Agencies, Advertising Regulations, Sales Promotion Tools.
- 19. International Retailing** – International Store Operations and Supply Chain Management of Leading International Retailers. International Retail Formats, International Retail Marketing Strategy.
- 20. Emerging Trends and Issues in International Marketing** – E-Marketing, Green Marketing, Digital Marketing, Multilevel Marketing (MLM), Web-based Marketing, and Network Marketing etc.

Further Readings

- WTO Report
- UNCTAD Report
- World Investment Report
- World Economic Survey, etc.

### **Area 3 – Banking and Finance**

- 1. Commercial Banks:** Overview of Commercial Banking in India; Role and Functions of Commercial Banks; Indian Banking in Pre,Nationalization and Post,nationalization Phases.
- 2. Banking Sectoral Reforms:** Banking Sector Reforms and their Implications on Indian Banking Sector; Changing Role of Indian Banks; Reforms and Restructuring of Banks;

Management of Private Sector Banks and Public Sector Banks; Management of Banks in Rural Areas.

3. **Basic Banking Services:** Opening of accounts for companies, trusts, societies, government and public bodies; Importance of AML.
4. **Credit concepts:** Principles of lending; Various credit Products/ Facilities - working capital and term loans; Credit Appraisal Techniques; Approaches to lending; Credit Management, credit monitoring ,NPA Management; Credit Risk Analysis Framework.
5. **Documentation:** Different types of documents; Documentation Procedures; Stamping of documents Securities; Types of collaterals and their characteristics; Priority Sector Lending - Sectors, Targets and Issues/Problems.
6. **Recent Developments:** Agriculture/SMEs/SHGs/SSI/Tiny Sector; Financing New Products & Services: Factoring, Securitization, bancassurance, Mutual Funds, Merchant Banking, Hire Purchase, Securitization, Venture Capital, Leasing and Depository, Credit Cards/Home Loans/Personal Loans/Consumer Loans; IT Application in Banking.
7. **Credit Rating in India:** Concept and reasons of credit rating; Credit rating institutions in India, Limitation of Credit Rating.
8. **Reforms in Banking and Finance:** Reports of the committees; Chakravarty committee, Narsimham Committee I & II :FDI in Banking Sector.
9. **International Banking:** An Overview; Rationale and Scope of International Banking Regulation; Capital Adequacy, loan loss provisioning and other Regulatory Controls.
10. **International Financial System:** An overview; Foreign Exchange Markets; Exchange rate determination; International party theory and Fisher effect; Foreign Exchange Risk Management.
11. **Financial Institutions:** Role of FDI, NBFCs and other International Financial Institutions
12. **Financial Markets:** Structure; Institutions and Operation Mechanism; Money Market in India; Importance; Feature and Instruments; Capital Market in India, New Issues Market and Secondary Market (Stock Exchanges); salient features and operation, changing scenario of Indian Stock Market.
13. **Valuation of Securities:** Equity shares and Bonds valuation models; CAPM, Arbitrary pricing theory.



**14 Corporate Valuation:** Approaches to Corporate Valuation; Restructuring; merger, acquisition and disinvestment leveraged buy-outs.

***References***

Chandra, Prasanna, Financial Management Theory and Practice, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007

Shapiro Alan C., Multinational Financial Management, Prentice Hall of India Ltd., New Delhi

Khan, M.Y. and Jain, P.K., Financial Management Text, Cases and Problems, Tata McGraw-Hill Publishing Company Ltd., New Delhi, 2007

Kishore, Ravi M.: Financial Management, Tax, Delhi.

Van Horne, James C., Financial Management and Policy, Prentice Hall of India Ltd., New Delhi

Damodaran on Valuation: Security Analysis for Investment and Corporate Finance (Wiley Finance)

Neelam C Gulati (2011) Banking and Insurance: Principles & Practices, 3<sup>rd</sup> edition, Excel Books, Daryaganj New Delhi

Gomez Clifford (2011) Banking and Finance: Theory, Law and Practice, 3<sup>rd</sup> edition, PHI, Daryaganj New Delhi

Indian Institute of Banking & Finance (2012): Principles and Practices of Banking, 2<sup>nd</sup> edition, McMillan, Daryaganj New Delhi.

Indian Institute of Banking & Finance (2012): Legal and Regulatory Aspect of Banking 2<sup>nd</sup> edition, McMillan, Daryaganj New Delhi.

N K Sinha (2009): Money Banking and Finance, 5<sup>th</sup> edition, Bsc Publisherco, Daryaganj, New Delhi

## Area 4: MARKETING MANAGEMNT

### 1. Defining Marketing for the 21<sup>st</sup> century

**The new marketing realities:** Marketing in 21<sup>st</sup> century, Markets: Consumer and Organisational markets, Strategic planning & the marketing environment ,Current issues in marketing ,Marketing research ,Buyer behaviour ,Segmentation, targeting and positioning, Value capture, Value creation ,Value delivery ,Value communication, Major Societal Forces, New Consumer Capabilities, New Company Capabilities, Integrated Marketing, Internal Marketing, Performance Marketing, Connecting with Customers, Shaping the Market Offerings.

**The Demographic Environment and its implication in marketing management:** Economic Environment, Social-Cultural Environment, Natural Environment, Technological Environment, Political-Legal Environment.

**Creating Customer Value:** Satisfaction and Loyalty, Customer Perceived Value (CPV), Total Customer Satisfaction, Monitoring Satisfaction, Maximizing Customer Lifetime Value (CLV), Cultivating Customer Relationships.

**Analyzing Consumer Markets:** What Influences Consumer Behaviour? Cultural Factors Social Factors, Personal Factors, Key Psychological Processes.

**Analyzing Business Markets:** Organizational Buying, The Business Market Versus the Consumer Market, Delivering Superior Customer Value, Managing Business-to-Business Customer Relationships, Business Relationships: Risks and Opportunism, Segment Marketing, Niche Marketing, Local Marketing, Balancing Customer and Competitor Orientations. Creating Brand Equity, Building brand equity, Measuring brand equity, Devising a branding strategy, crafting brand positioning.

### 2. Marketing Decisions

**Product Decisions:** Setting Product Strategy, Differentiation, Product and brand relationship, The Product Hierarchy, Product Systems and Mixes, Product-Line Analysis Product-Line Length, Packaging, Labeling, Warranties, and Guarantees.

**Designing and Managing Services:** The Nature of Services, Categories of Service Mix Distinctive Characteristics of Services, Service Experience , Service Innovation, Service Delivery, Service Quality, service recovery and its implications on business. Managing Service Brands, Developing Brand Strategies for Services, Developing Service Offers for Rural Areas, Managing Product-Support Services, Identifying and Satisfying Customer Needs, Postsale Service Strategy.

**Pricing Decisions:** Developing Pricing Strategies and Programs, Consumer Psychology and Pricing, Setting the Price, Adapting the Price, Geographical Pricing (Cash, Countertrade, Barter), Price Discounts and Allowances, Promotional Pricing, Differentiated Pricing, Pricing for Rural Markets, Initiating and Responding to Price Changes, Responding to Comptitiors's Price Changes

**Distribution Decisions (logistics decisions):** Designing and Managing Integrated Marketing Channel, Marketing Channels and Value Networks, Channel Integration and Systems, Vertical Marketing Systems, The Importance of Channel Stewards, Horizontal Marketing Systems, Integrating Multichannel Marketing Systems, Conflict, Cooperation, and Competition, Channel Conflict and Competition, Managing Channel Conflict, Dilution and Cannibalization, Legal and Ethical Issues in Channel Relations, Managing Retailing, Wholesaling, and Logistics.

**Promotion Decisions:** Communicating Value, Designing and Managing Integrated Marketing Communications, The Changing Marketing Communication Environment, Marketing Communications, Brand Equity, and Sales, The Communications Process Models, Developing Effective Communications, Celebrity Endorsements as a Strategy, Selecting the Communications Channels, Establishing the Total Marketing Communications Budget, Deciding on the Marketing Communications Mix, Managing the Integrated Marketing Communications Process, Implementing IMC, Managing Mass Communications: Advertising, Sales Promotions, Events and Experiences, and Public Relations, Developing and Managing an Advertising Program, Communicating to the Rural Audience, Deciding on Media and Measuring Effectiveness, Sales Promotion in Indian market, Events and Experiences, Public Relations, Managing Personal Communications: Direct and Interactive Marketing, Word of Mouth, and Personal Selling, Direct Marketing, Public and Ethical Issues in Direct Marketing, Interactive Marketing, Placing Ads and Promotions Online, Word of Mouth, Buzz and Viral Marketing, Creating successful long term growth.

### 3. Marketing research

Introduction to Marketing Research, Qualitative and quantitative research methods, Sampling methods, Questionnaire design, reliability and validity. Online survey method, Data preparation and data presentation (graphing), Analysis of Variance (ANOVA) and Analysis of Covariance (ANCOVA), Cluster Analysis, Factor analysis, Presenting research information

### 4. Emerging Trends in marketing:

Rural Marketing, Green marketing, Experiential marketing, Digital Marketing, e-business, Online marketing, Online retailing, Neuroscience and consumer, Sports Marketing, Media marketing and advertising, Brand Management, Innovation and marketing

### Reference Books

- Marketing Management by Arum Kumar and N Meenakshi
- The Rural Marketing Book by Kashyap Raut
- Marketing Management a south Asian Perspective by Philip Kotler, Kevin Lane Keller, Abraham Koshi and Mithileshwar Jha, Pearson Prentice Hall, 2009
- Research Methodology, Concepts and cases by Deepak Chawla and Neena Sondhi, Vikas Publishing house private limited

- Marketing management Ranjan Saxena, Tata McGraw Hill Publishing Company limited
- Marketing management, Cases and Concepts, Nikihilesh Dholakia, Rakesh Khurana, Labdhi Bhandari, Abhinandan K jain, Macmilan India

## **Area 5 : Entrepreneurship and Small Business Management**

### **1. Entrepreneurship and economic development**

**Entrepreneurship theory and literature:** Entrepreneurship in India and abroad, Entrepreneurial motivation (socio- economic factors in entrepreneurship development, basic skills in entrepreneurship), Entrepreneurial environment, Entrepreneurship development Programmes, Entrepreneurial functions, Analysis of barriers in entrepreneurship development, Analysis of success factors of entrepreneurship development.

**Entrepreneurship's Importance:** Economic impact of entrepreneurial firms, Entrepreneurial Firms' impact on society, Entrepreneurial Firms' impact on larger firms, Entrepreneurial Firms' impact on overall economic development of a nation Entrepreneurship development.

### **2. Creativity and Innovation in business**

Encouraging creativity at the firm level, protecting ideas from being lost or stolen, IPR, Creation of effective innovation ,Market dynamics and new technology, Diffusion and adoption of innovations, Marketing and sales of technology based products and services.

### **3. Enterprise creation**

Screening of ideas, opportunity identification and selection, moving from an idea to an entrepreneurial firm, New enterprise creation: Conceptual and analytical tools to understand, analyze and manage critical aspects of new enterprise, Business plan preparation and Analysis, feasibility analysis of business ( product/ service feasibility, industry/ market feasibility, organizational feasibility and Financial feasibility analysis, Industry and competitor analysis), Business crisis, Family business management, Small and medium enterprises (threats and opportunities),

**Ddeveloping an effective Business models:** The importance of business models, How buisness models emerge, potential fatal flaws of business models.

### **4. Enterprise Management**

**Small and medium enterprise (managing and growing entrepreneurial firm):**

Essentials of management principles, its application on enterprise management, planning, importance and application of planning in an organisation, strategic planning and its application.

**Human resource Management:** recruitment, selection and induction of key employees, training and development, performance appraisals, application of exit interviews etc., Board of directors, Professional advisers, lenders and investors, other professionals.

**Organisation Behaviour:** Motivation and behavior, designing Motivating jobs, perception, personality, Stress and behavior, Group behavior, Intergroup relations, conflict and its impact on organization, Leadership in organisation, followership, transaction analysis, analysis and application of leadership styles, Organisation structure and design, Organisational change and development, organizational culture and climate.

**Controlling** (PERT, CPM and other emerging methods to establish control in an organization. Managing human resources and organization development and dynamics, Personnel and Industrial relations, Sources of capital and capitalization process, Venture capitals, Angel investors etc, Intrapreneurship.

**5. Micro business development**

What are micro businesses, Role of Government in micro business development, Importance of micro businesses in an economy ,Micro finance , Self help groups, Direct funding from financial institutions.

**6. New Age entrepreneurship**

Agri- entrepreneurship, Edu-preneurship (education/academic entrepreneurship), Technopreneurs (nano technology, bio technology)

**7. Social Entrepreneurship**

Social entrepreneurship, social entrepreneurs as change agents, financial sustainability  
Social entrepreneurship in India and abroad

**8. Women Entrepreneurship**

State of women Entrepreneurship in India. Barriers to women Entrepreneurship development.

**9. Business ethics**

Corporate Social responsibility  
Corporate governance

**10. Succession Planning**

Business growth and need of succession Planning in India. Its role and importance in expansion management.

**Reference Books:**

- Small Business Management and Entrepreneurship by David Stokes, Nicholas Wilson
- Think and Grow Rich by Napoleon Hill an e-book
- Entrepreneurship and small business management by Norman M Scarborough
- Entrepreneurial Development By Vasant Desai
- Entrepreneurship and entrepreneurial Development by M. Gangadhar Rao
- Organisational Behaviour By Jit S Chandan, Vikas publishing house Private Limited

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## 16. PhD in Management (PHDMGMT)

The question paper will have the following two parts:

- 1) Research Methodology
- 2) Management (Financial Management, Human Resource Management, Marketing Management, Operations Management and General Management)

The question paper will be objective type and will be of 3 hours duration. The total number of marks will be 100 and each part will have a weightage of 50%.

### Part 1

#### Research Methodology

1. Foundations of Research: Meaning, Objectives, Motivation, Utility. Concept of theory, empiricism, deductive and inductive theory. Characteristics of scientific method – Understanding the language of research – Concept, Construct, Definition, Variable.

#### Research Process

2. Problem Identification & Formulation – Research Question – Investigation Question – Measurement Issues – Hypothesis – Qualities of a good Hypothesis – Null Hypothesis & Alternative Hypothesis. Hypothesis Testing – Logic & Importance
3. Research Design: Concept and Importance in Research – Features of a good research design – Exploratory Research Design – concept, types and uses, Descriptive Research Designs – concept, types and uses. Experimental Design: Concept of Independent & Dependent variables
4. Qualitative and Quantitative Research: Qualitative research – Quantitative research – Concept of measurement, causality, generalization, replication. Merging the two approaches.
5. Measurement: Concept of measurement– what is measured? Problems in measurement in research – Validity and Reliability. Levels of measurement – Nominal, Ordinal, Interval, Ratio.
6. Sampling: Concepts of Statistical Population, Sample, Sampling Frame, Sampling Error, Sample Size, Non Response. Characteristics of a good sample. Probability Sample – Simple Random Sample, Systematic Sample, Stratified Random Sample & Multi-stage sampling. Determining size of the sample – Practical considerations in sampling and sample size.
7. Data Analysis: Data Preparation – Univariate analysis (frequency tables, bar charts, pie charts, percentages), Bivariate analysis – Cross tabulations and Chi-square test including testing hypothesis of association.

8. Interpretation of Data and Paper Writing – Layout of a Research Paper, Journals in Computer Science, Impact factor of Journals, When and where to publish ? Ethical issues related to publishing, Plagiarism and Self-Plagiarism.
9. Use of Encyclopedias, Research Guides, Handbook etc., Academic Databases for Computer Science Discipline.
10. Use of tools / techniques for Research: methods to search required information effectively, Reference Management Software like Zotero/Mendeley, Software for paper formatting like LaTeX/MS Office, Software for detection of Plagiarism

## **Part 2**

Management (Financial Management, Human Resource Management, Marketing Management, Operations Management and General Management)

### **I**

Managerial Economics – Demand Analysis

Production Function

Cost – Output Relations

Market Structures

Pricing Theories

Advertising

Macro – Economics

National Income Concepts

Infrastructure – Management and Policy

Business Environment

Capital Budgeting

### **II**

The concept and significance of organisational behaviour – Skills and Roles in an organisation – Classical, Neo – Classical and Modern Theories of Organisational Structure – Organisational Design – Understanding and Managing individual behavior personality – Perception – Values – Attitudes – Learning – Motivation. Understanding and Managing Group Behaviour, Processes – Inter – personal and group dynamics – Communication – Leadership – Managing change – Managing conflicts. Organisational Development.

### **III**

Concepts and perspectives in HRM; HRM in changing environment.

Human Resource Planning – Objectives, Process and Techniques.

Job analysis – Job Description.

Selecting Human Resources.

Induction, Training and Development.

Exit policy and Implications.

Performance Appraisal and Evaluation.

Potential Assessment.

Job Evaluation.

Wage Determination.

Industrial Relations and Trade Unions.

Dispute Resolution and Grievance Management.  
Labour Welfare and Social Security Measures.

#### **IV**

Financial Management – Nature and Scope.  
Valuation Concepts and Valuation of Securities.  
Capital Budgeting Decisions – Risk Analysis.  
Capital Structure and Cost of Capital.  
Dividend Policy – Determinants.  
Long – Term and Short – Term Financing Instruments.  
Mergers and Acquisitions.

#### **V**

Marketing Environment and Environment Scanning; Marketing Information Systems and Marketing Research; Understanding Consumer and Industrial Markets; Demand Measurement and Forecasting; Market Segmentation – Targeting and Positioning;  
Product Decisions, Product mix, Product Life Cycle; New Product Development; Branding and Packaging; Pricing Methods and Strategies.  
Promotion Decisions – Promotion mix; Advertising; Personal Selling; Channel Management; Vertical Marketing Systems; Evaluation and Control of Marketing Effort; Marketing of Services; Customer Relation Management; Uses of Internet as a Marketing Medium – Other related issues like branding, market development, Advertising and retailing on the net. New issues in Marketing.

#### **VI**

Role and Scope of Production Management; Facility Location; Layout Planning and Analysis; Production Planning and Control – Production Process Analysis; Demand Forecasting for Operations; Determinants of Product mix; Production Scheduling; Work measurement; Time and Motion Study; Statistical Quality Control. Supply Chain Management and Materials Management Role and Scope of Operations Research; Linear Programming; Sensitivity Analysis; Duality; Transportation Model; Inventory Control; Queueing Theory; Decision Theory; Markov Analysis; PERT / CPM.

#### **VII**

Probability Theory; Probability distributions – Binomial, Poisson, Normal and Exponential; Correlation and Regression analysis; Sampling theory; Sampling distributions; Tests of Hypothesis; Large and small samples; t z, F, Chi – square tests.  
Use of Computers in Managerial applications; Technology issues and Data processing in organizations; Information systems; MIS and Decision making; System analysis and design; Trends in Information Technology; Internet and Internet – based applications.



## **VIII**

Concept of Corporate Strategy; Components of Strategy Formulation; Ansoffs Growth Vector; BCG Model; Porter's Generic Strategies; Competitor Analysis; Strategic Dimensions and Group Mapping; Industry Analysis; Strategies in Industry Evolution, Fragmentation, Maturity, and decline.

Competitive strategy and Corporate Strategy; Transnationalization of World Economy; Managing Cultural Diversity; Global Entry Strategies; Globalisation of Financial System and Services; Managing International Business; Competitive Advantage of Nations; RTP and WTO.

## **IX**

Concepts – Types, Characteristics; Motivation; Competencies and its development; Innovation and Entrepreneurship; Small business – Concepts Government policy for promotion of small and tiny enterprises; Process of Business Opportunity Identification; Detailed business plan preparation; Managing small enterprises; Planning for growth; Sickness in Small Enterprises; Rehabilitation of Sick Enterprises; Intrapreneurship (Organisational Entrepreneurship).

## **X**

Ethics and Management System; Ethical issues and Analysis in Management; Value based organisations; Personal framework for ethical choices; Ethical pressure on individual in organisations; Gender issues; Ecological consciousness; Environmental ethics; Social responsibilities of business; Corporate governance and ethics.

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## **17. PhD in Education (PHDES)**

### **(A) Methodology of Educational Research**

Sources of acquiring Knowledge, Meaning and Scope of Educational Research, Meaning and steps of Scientific Method, Characteristics of Scientific Method (Replicability, Precision, Falsifiability and Parsimony), Types of Scientific Method (Exploratory, Explanatory and Descriptive), Aims of research as a scientific activity: Problem-solving, Theory Building and Prediction, Types of research (Fundamental, Applied and Action research), Ethical considerations in Research

Criteria and sources of identifying the research problem, Survey, review and importance of related literature, Selection, definition and evaluation of research problem, Writing Objectives

Hypotheses - Concept, Sources, Types (Research, Directional, Non-directional, Null), Formulating Hypothesis, Characteristics of a good hypothesis, Concept of Universe and Sample, Characteristics of a good Sample, Techniques of Sampling (Probability and Non-probability Sampling), Tools of Research - Validity, Reliability and Standardisation of a Tool, Types of Tools (Rating scale, Attitude scale, Questionnaire, Aptitude test and Achievement Test, Inventory), Techniques of Research (Observation, Interview and Projective Techniques)

Variables: Meaning of Concepts, Constructs and Variables, Types of Variables (Independent, Dependent, Extraneous, Intervening and Moderator)

Tools and techniques of data collection - Characteristics of a good research tool  
Types of research tools and techniques and their use

Major Approaches to Educational Research - Quantitative Research, Qualitative Research and Mixed Methods Research

Methods of Educational Research - Historical research, Descriptive research, Experimental research, Ex post facto research

Statistical Analysis of Data: Types of Measurement Scale (Nominal, Ordinal, Interval and Ratio), Quantitative Data Analysis - Descriptive data analysis (Measures of central tendency, variability, fiduciary limits and graphical presentation of data), Testing of Hypothesis (Type I and Type II Errors), Levels of Significance, Power of a statistical test and effect size, Parametric Techniques, Non- Parametric Techniques, Inferential data analysis, Use and Interpretation of statistical techniques: Correlation, t-test, z-test, ANOVA, ANCOVA, Chi-square (Equal Probability and Normal Probability Hypothesis). Qualitative Data Analysis - Data Reduction and Classification, Analytical Induction and Constant Comparison, Concept of Triangulation

Writing Research Report - Meaning and scope, Format of research reports, Presentation Dissemination

**(B) Subject Specific Areas:****(i) Philosophical and Sociological Foundations of Education**

Relationship of Education and Philosophy, Indian and Western Schools of Philosophy and their educational implications; Contributions of Vivekananda, Tagore, Gandhi and Aurobindo to Indian Education; National values as enshrined in the Indian Constitution, and their educational implications; Philosophical Inquiry in Education, Nature and Scope, Steps, Philosophical inquiry of current educational issues.

Education as a social sub-system-specific characteristics: Education and its relationship with modernization and democracy; Education and its relationship with the home, community; Socialization of the child; Meaning and nature of social change: Education as related to social equity and equality of educational opportunities; Constraints on social change in India; Education of the socially and economically disadvantaged sections of the society including students with special needs. Social mobility.

**(ii) Learner, Learning Process and Assessment**

Growth and Development: Concept and principles, Social, emotional and cognitive development. Individual differences. Personality - Definitions and theories (Freud, Carl Rogers, Gordon Allport, Max Wertheimer, Kurt Koffka), learning styles and their implications on individual in succeeding in his/her learning; Motivation - concept; determinants and types, implications of motivation on learning; Group dynamics and role of teacher in developing positive class room climate. Mental health and mental hygiene.

Approaches to Intelligence from Unitary to Multiple: Concepts of Social intelligence, multiple intelligence, emotional intelligence Theories of Intelligence by Sternberg, Gardner, Assessment of Intelligence, Concepts of Problem Solving, Critical thinking, Metacognition and Creativity.

Principles and Theories of learning: Behaviouristic, Cognitive and Constructivist theories of learning, Factors affecting learning, learning environment, Concept of social cognition, understanding social relationship and socialization goals.

Assessment – Meaning, nature, perspectives (assessment for Learning, assessment of learning and Assessment as Learning) - Types of Assessment - Placement, diagnostic, formative, summative, Criterion-referenced and Norm-referenced. Relation between objectives and outcomes, Assessment of Cognitive (Anderson and Krathwohl), Affective (Krathwohl) and Psychomotor domains (R.H. Dave) of learning.; Issues in Assessment and Evaluation.

Assessment in pedagogy of education – feedback devices, meaning, types, and criteria. Assessment of Portfolios, Reflective Journal, Field Engagement using Rubrics, Competency Based Evaluation, Assessment of Teacher Prepared ICT Resources, performance-based assessment, issues in assessment and evaluation.

### **(iii) Curriculum Studies**

Concept and Principles of Curriculum, Strategies of Curriculum Development, Stages in the Process of Curriculum development, Foundations of Curriculum Planning - Philosophical Bases (National, democratic), Sociological basis (socio cultural reconstruction), Psychological Bases (learner's needs and interests), Bench marking and Role of National level Statutory Bodies - UGC, NCTE and University in Curriculum Development

Models of Curriculum Design: Traditional and Contemporary Models (Academic/ Discipline Based Model, Competency Based Model, Social Functions/Activities Model (social reconstruction), Individual Needs and Interests Model, Outcome Based Integrative Model, Intervention Model, Context, Input, Process, Product Model (C I P P Model). Instructional System, Instructional Media, Instructional Techniques and Material in enhancing curriculum Transaction, Approaches to Evaluation of Curriculum : Approaches to Curriculum and Instruction (Academic and Competency Based Approaches), Models of Curriculum Evaluation: Tyler's Model, Stakes' Model, Scriven's Model, Kirkpatrick's Model

Meaning and types of Curriculum change, Factors affecting curriculum change, Approaches to curriculum change, Role of students, teachers and educational administrators in curriculum change and improvement, Scope of curriculum research and Types of Research in Curriculum Studies.

### **(iv) Educational Management, Administration and Leadership**

Educational Management and Administration – Meaning, Principles, Functions and importance, Institutional building, POSDCORB, CPM, PERT, Management as a system, SWOT analysis, Taylorism, Administration as a process, Administration as a bureaucracy, Human relations approach to Administration, Organisational compliance, Organisational development, Organisational climate

Leadership in Educational Administration: Meaning and Nature, Approaches to leadership: Trait, Transformational, Transactional, Value based, Cultural, Psychodynamic and Charismatic, Models of Leadership (Blake and Mouton's Managerial Grid, Fiedler's Contingency Model, Tri-dimensional Model, Hersey and Blanchard's Model, Leader-Member Exchange Theory.

Concept of Quality and Quality in Education: Indian and International perspective, Evolution of Quality: Inspection, Quality Control, Quality Assurance, Total Quality Management (TQM), Six sigma, Quality Gurus: Walter Shewart, Edward Deming, C.K Pralhad

Change Management: Meaning, Need for Planned change, Three-Step-Model of Change (Unfreezing, Moving, Refreezing), The Japanese Models of Change: Just-in-Time, Poka

yoke, Cost of Quality: Appraisal Costs, Failure costs and Preventable costs, Cost Benefit Analysis, Cost Effective Analysis, Indian and International Quality Assurance Agencies: Objectives, Functions, Roles and Initiatives (National Assessment and Accreditation Council [NAAC], Performance Indicators, Quality Council of India (QCI), International Network for Quality Assurance Agencies in Higher Education (INQAAHE).

**(v) Educational Technology and ICT**

Concept of Educational Technology (ET) as a Discipline: (Information Technology, Communication Technology, Information and Communication Technology (ICT) and Instructional Technology, Application of Educational Technology in formal, non-formal (Open and Distance Learning), informal and inclusive education systems, Overview of Behaviourist, Cognitive and Constructivist Theories and their implications to Instructional Design (Skinner, Piaget, Ausubel, Bruner, Vygotsky), Relationship between Learning Theories and Instructional Strategies (for large and small groups, formal and non formal groups )

Systems Approach to Instructional Design, Models of Development of Instructional Design (ADDIE, ASSURE, Dick and Carey Model Mason's), Gagne's Nine Events of Instruction and Five E's of Constructivism, Nine Elements of Constructivist Instructional Design, Application of Computers in Education: CAI, CAL, CBT, CML, Concept, Process of preparing ODLM, Concept of e learning, Approaches to e-learning (Offline, Online, Synchronous, Asynchronous, Blended learning, mobile learning)

Emerging Trends in e-learning: Social learning (concept , use of web 2.0 tools for learning, social networking sites, blogs, chats, video conferencing, discussion forum), Open Education Resources (Creative Common, Massive Open Online Courses; Concept and application), e-Inclusion - Concept of e-Inclusion, Application of Assistive technology in E learning , Quality of e-Learning – Measuring quality of system: Information, System, Service, User Satisfaction and Net Benefits (D&M IS Success Model, 2003), Ethical Issues for e-Learner and e-Teacher - Teaching, Learning and Research.

Use of ICT in Evaluation, Administration and Research: E portfolios, ICT for Research - Online Repositories and Online Libraries, Online and Offline assessment tools (Online survey tools or test generators) – Concept and Development.

**(vi) Inclusive Education**

Inclusive Education: Concept, Principles, Scope and Target Groups (Diverse learners; Including Marginalized group and Learners with Disabilities), Evolution of the Philosophy of Inclusive Education: Special, Integrated, Inclusive Education, Legal Provisions: Policies and Legislations (National Policy of Education (1986), Programme of Action of Action (1992), Persons with Disabilities Act (1995), National Policy of Disabilities (2006), National Curriculum Framework (2005), Concession and Facilities to Diverse Learners (Academic and Financial), Rehabilitation Council of India Act (1992),

Inclusive Education under Sarva Shiksha Abhiyan (SSA), Features of UNCRPD (United Nations Convention on the Rights of Persons with Disabilities) and its Implication

Concept of Impairment, Disability and Handicap, Classification of Disabilities based on ICF Model, Readiness of School and Models of Inclusion, Prevalence, Types, Characteristics and Educational Needs of Diverse learners' Intellectual, Physical and Multiple Disabilities, Causes and prevention of disabilities, Identification of Diverse Learners for Inclusion, Educational Evaluation Methods, Techniques and Tools

Planning and Management of Inclusive Classrooms: Infrastructure, Human Resource and Instructional Practices, Curriculum and Curricular Adaptations for Diverse Learners, Assistive and Adaptive Technology for Diverse learners: Product (Aids and Appliances) and Process (Individualized Education Plan, Remedial Teaching), Parent-Professional Partnership: Role of Parents, Peers, Professionals, Teachers, School

Barriers and Facilitators in Inclusive Education: Attitude, Social and Educational, Current Status and Ethical Issues of inclusive education in India, Research Trends of Inclusive Education in India

**(vii) Educational Guidance and Counselling**

Understanding Guidance - Meaning and Definitions, Misconceptions about guidance, Need for guidance, Purpose of guidance: self-understanding, self-discovery, self-reliance, self-direction, self-actualization, Scope of guidance programme, Planning Guidance Programmes

Types of Guidance and Group Guidance: Types of Guidance-Educational, Vocational/Career and Personal, Individual guidance and group guidance; advantages of group guidance, Group guidance techniques-class talk, career talk, orientation talk, group discussion, career conference, career corner, bulletin board, role play.

Understanding Counselling - Meaning and nature of counselling, Misconceptions about Counselling, Scope of counselling, Goals of counselling: resolution of problems, modification of behaviour, promotion of mental health. Relationship between guidance and counselling: place of counselling in the total guidance programme

Counselling Process and Counselling Relationship - Stages of the counselling process, Counselling Techniques-person centred and group centred, cognitive interventions, behavioural interventions, and systematic interventions strategies. Theories of Counselling, Skills and qualities of an effective counsellor, Professional ethics

Types and Areas of Counselling - Uses of group process in counselling, Process of group counselling, Areas of counselling: family counselling, parental counselling, adolescent counselling, counselling of girls, counselling of children belonging to special groups, Peer counselling: Its concept and the relevance to the Indian situation, Steps and skills in group counselling process.

**(viii) Teacher Education**

Development of Teacher Education in India, NCTE Curricular Frameworks for Teacher Education; Objectives and organization of curriculum of teacher education at various levels; Agencies involved in Pre-service and In-service teacher education; Teacher education through Open and Distance Education; Quality assurance in Teacher Education Programme.

Meaning, Nature and Scope of Teacher Education; Types of Teacher Education Programmes, The Structure of Teacher Education Curriculum and its Vision in Curriculum Documents of NCERT and NCTE at Elementary, Secondary and Higher Secondary Levels, Organization of Components of Pre-service Teacher Education Transactional Approaches (for foundation courses) Expository, Collaborative and Experiential learning.

Understanding Knowledge base of Teacher Education from the view point of Schulman, Deng and Luke and Habermas, Meaning of Reflective Teaching and Strategies for Promoting Reflective Teaching, Models of Teacher Education - Behaviouristic, Competency-based and Inquiry Oriented Teacher Education Models

Concept, Need, Purpose and Scope of In-service Teacher Education, Organization and Modes of In-service Teacher Education, Agencies and Institutions of In-service Teacher Education at District, State and National Levels (SSA, RMSA, SCERT, NCERT, NCTE and UGC), Preliminary Consideration in Planning in-service teacher education programme (Purpose, Duration, Resources and Budget)

Concept of Profession and Professionalism, Teaching as a Profession, Professional Ethics of Teachers, Personal and Contextual factors affecting Teacher Development, ICT Integration, Quality Enhancement for Professionalization of Teacher Education, Innovation in Teacher Education.

**(ix) Adult Education**

Adult Education – Basic concepts and meaning. Adult and Continuing Education -- Pre and Post Independent India, Extension Education and Services in India -- Phases and Movements, Adult Education Perspectives: Asian, Latin American, European and American perspectives

Need, concept, types and characteristics of Lifelong Learning programmes in India, Opportunities for Lifelong Learning and Extension, Agencies in Lifelong Learning in and outside India, Comparative Studies in Adult Education: Parameters, Trends and Analysis Theoretical and Functional bases of Adult Education -- Liberal, Behaviouristic, Progressive, Humanistic, Radical and Analytical approaches of Adult Education, Social and educational perspectives of Tagore, Gandhi, Vivekananda, Radhakrishnan, Ambedkar and other Indian thinkers

Androgogy and Pedagogy -- Issues of marginalization and pedagogy of women, tribals, minorities, transgender, aged and persons with disability, Attributes and distinctive features of adult learning and development, Individual Vs. Group learning approaches in Adult Education, Experiences and learning from agriculture, home science, community

health and technology, Learning needs of diverse group of adult learners, Recognition of prior learning --Resolving the dilemmas of institutional and non-institutional learning, Theories of adult learning, Professionalization of adult education

Policy Planning and Implementation of Adult Education in India – Five Year Plans, Implementing Agencies – Role of Government Departments, Role of Universities, Colleges and Students, Role of NGOs, Role of Local Bodies, Community and individuals, Understanding Networking in Adult Learning, National Literacy Mission; Objectives, strategies, Total Literacy Campaigns, Post-Literacy Campaigns and Continuing Education programmes, Operationalization of the concept of vocational education in adult, continuing education and Lifelong Learning through state supported structures like Jan Shikshan Sansthan (JSS) and non state supported structures of Industrial and Business houses, Population Education: Concept and paradigm shift Development and its indicators, Millennium Development Goals (MDGs), Sustainable Development Goals (SDGs) , Building learning communities -- Towards a learning society

**Note: Weightage for Methodology of Educational Research (50%) and Subject Specific Areas (50%)**

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## **18. PhD in Gender & Development Studies (PHDGD)**

### **Course I (8 credits) Concepts and Theories for PhD in Gender and Development Studies**

#### **1. Concepts and Theories**

Goals and Praxis of Gender and Development, History of Feminists Movement and Formation of Patriarchy, Emergence of Gender and Development Studies in India, Gender Sensitive Planning and Policy Making, Gender Mainstreaming, Gender Analysis, Gender Auditing and Gender Budgeting, Gender and Democracy, Gender Justice, Gender Equality and Equity.

#### **2. The Development Debate**

Changing Notions of Development, Development and Post Development Theories, Critique of Development theories from a Gender Perspective, Development and Underdevelopment (Dependency Theory and its Critiques); WAD/WID/GAD, Power and Decision Making, Gender and Empowerment, Gender and Poverty, HDI, GDI, GEM - Approaches and Indicators.

#### **3. Gender and Livelihoods**

Issues in Gender and Environment, Climate Change, Sustainable Environment, Green Politics, Food Security; Land Rights, Right to Forest Resources, Gender, Water and Sanitation, Security of land tenure, Sustainable Development, Ecological Security.

#### **4. Gender and Work**

Theories of Feminist Economics; Debates on Women's Labour, Gender Based Division of Labour in Pre-Industrial and Industrial Society, Gender Segregation in the Labour Force, Labour Force Participation of Women in National Economy, Productive and Unproductive Work, Domestic Labour, Female Headed Households, Women and issues of Poverty, Visibility of Women in Statistics and Indicators, Gender Concerns in Formal and Informal Sectors, Social Security and Decent Work, Women's Contribution to National Wealth.

#### **5. Demographic, Nutrition and Health Dimensions**

Demographic Characteristics (Sex ratio, Population distribution, Census Enumeration and the debates on Indian Census), Gender Based Violence, Migration, Gender and Health (Nutritional Needs, Occupational Health) Poverty and Food Security, Basic Needs and Development Goals

## 6. Gender and Culture

Debates in Gender and Culture, Construction of Gender, Formation of Patriarchy, Nature of Indian Patriarchy, Variations in the Theories of Femininity and Masculinity: Cross- Cultural Perspectives, Gender Roles, Gender Ideology, Issues of Ethnicity and Multiculturalism; Communitarianism, Recent debates in Gender and Literature: Post- structuralism; Post-colonialism; Post-feminism; Feminist Futures; Eco Feminism and Environmental Humanisms, Communication, Media and Gender Debates, Changing Gender Roles and Identities: Sexualities and Queer issues; Recent debates on Gender, Education and Social Development, Social Equity and Distributional Aspects of Development in Education and Health.

## 7. Case Studies and Selected Readings

### Course II

#### **Research Methodology in Gender and Development Studies (8 credits)**

##### 1. Researching Gender- I

Debates in the difference between Social and Natural Science, Positivism, Empiricism, Rationalism, Realism, Post Empiricism, Feminist Critique of Positivism, Feminist Epistemology, Stand Point Theory; Gendered Ontology and Changing terms of Societal Inquiry: Liberalism, Marxism, Hermeneutics, Feminism, Post- Modernism, Post-Colonialism and Post-structuralism, Gender and Ethnographic Cultural Studies, Life Histories and Narratology, Gender and Discourse Analysis

##### 2. Researching Gender- II

Quantitative and Qualitative Research, Feminist Paradigms, Feminist Research Methods and Ethics, Situating Differences, Interdisciplinary Methods in Feminist Research. Processes of Gendering and the Institutionalizing Gender and Gender Relations, Building Alternative Knowledge Base and Feminist World View (Weltanschauung): State, Society, Industry and Market.

##### 3. Research Design, Types and Strategies

Research Design, Exploratory Studies, Surveys, Historical, Experimental, Ethnographic and Case Studies; Types of Research- Fundamental, Applied Research,

Action Research, Experimental, Ex-Post Facto Research, Descriptive, Correlational Research, Participatory Research, Special Approaches for Studying Gender- Sensitive Problem- Centred, Policy Relevant and Action Oriented Research, Linking Policy and Research as Strategies for Advocacy

#### **4. Sampling**

Definition of Population, Sample, Merits and Demerits of Sampling; Probability Sampling: Random Sampling, Multi-stage Sampling, Cluster Sampling, Non-Probability Sampling, Purposive Sampling, Convenience Sampling, Quota Sampling; Sampling Designs for Various Types of Research; Critical Review of Sampling Design of Different Research Studies.

#### **5. Tools and Techniques of Research**

Questionnaire, Interview (Media and Internet), Scaling, Measurement, Focus Group Discussions, Observation, Narration, Gender Analysis Matrix and Impact Flow Chart

#### **6. Selected Studies in Gender and Development\**

Factors Determining and Influencing Gender and Development; Gender Division of Labour, Time use Survey and Management; Women's Status and Challenges; Household allocation of Resources; Access to Natural Resources; Time Scale for Rural Households; Value Added Analysis for Households: Production/Goods/Resources, Household Decision Making.

#### **7. Data Analysis**

Quantitative Data Analysis; Parametric Tests used for Quantitative Data Analysis; Qualitative Data Analysis, Non-Parametric Tests used for Analysis of Qualitative Data; Presentation of Data (Tables, Graphs etc.); Interpretation of Data.

#### **8. Preparing and Presenting Research Reports**

Evaluation Research; Report Writing/Paper Presentation, Bibliography/References/Citations; Research Ethics; Research Proposals Seeking Grants; Research Funding Sources

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## 19. PhD in Journalism & Mass Communication (PHDJMC)

- Media and Society - functions, role, access and interaction. Contemporary developments in the media as an institution.
- Concepts and models of various communication settings : Communication: Concept & Process; Models of Communication; Theories of Mass Communication
- Different Schools of thoughts - related communication discipline : Media Content: Information, Education & Entertainment; Functions of Media; Impact of Media; and Media Economics and Finance.
- Mass Audience; Access to Media; Mass Media Policies. Health & Education; Gender and Media; Media and Environment; Media & Human Rights.
- Mass Communication and Culture; New Media, Networked Society – New Theory; Media Economics, Ownership, Control and Governance; The Production of Media Content; Media Content: Issues, Concepts and Method of Analysis;
- The Behaviorist and Cognitive Orientations: The Learning Theories. The Yale Communication Research Studies. Persuasion and Attitude. Social Judgement Theory (Sherif et al.) Theory of Reasoned Action (Fishbein & Ajzen). The Cognitive Theories: The Balance, Dissonance, Congruity and Consistency theories and their applications to communication research.
- Critical Orientations: The Feminist Theories – The Culture Studies Theories.
- Children and Media Violence: Social learning Theory/Social Cognition (Bandura); Disinhibition and Cue Theory (Berkowitz); and Arousal Theory / Excitation Transfer (Tannenbaum and Zillman).
- “Middle Range” Theories (Selections): Uses and Gratifications; Agenda Setting by the Media; Cultivation of Perceptions of Reality (George Gerber); Limited and Selective Influences Theory.
- Overview of communication research paradigms: philosophical assumptions of positivism, interpretivism, critical paradigms. What is scientific? Logic of scientific reasoning: Terms, propositions, arguments; deductive and inductive reasoning in research

- Research design: Quantitative Variables: Types of variables; unit of analysis; exploratory, explanatory and predictive research, Measurement: conceptual and operational definitions; levels of measurement: nominal, ordinal, interval, ratio; basic understanding of reliability and validity. Sampling: why sample? Samples and population of interest; sampling design: probability and non-probability sampling; factors affecting choice of sampling design; sample size and determining sample size; stages of quantitative research
- Data collection methods: Quantitative Experimentation: Logic of experimentation: testing causal relationships; random assignment; internal and external validity; sampling in experiments; experimental designs; field experiments. Survey research: General features of survey design; strengths and limitations; survey research designs: cross-sectional and longitudinal. Questionnaire construction: Steps leading to construction of questionnaire; content and format; leading and loaded questions; pre-testing questionnaires; tabulating data.
- Data analysis: Quantitative. Introduction to statistics, Measures of central tendency: Mean, median, mode; when to use them. Measures of dispersion: range, semi-quartile range, standard deviation. non-parametric and parametric statistical tests: location of scores and standardized distributions. Introduction to probability; Probability and samples: The distribution of sample means; Hypothesis testing procedure

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## **20. Ph.D. in Dairy Science and Technology (PHDDR)**

Dairy development in the country and different organizations engaged in the dairy development in India. The present status and future development plans. Advances in safe and clean milk production. Chemical composition, nutritive value and physico-chemical properties of milk and milk products. Microbiological aspects of milk and milk products. Physical and Chemical methods to control growth of Microorganisms.

Chemistry of the principal constituents of milk, i.e. water, lactose, lipids, proteins (including enzymes), salt and vitamins. Food Fermentation. Dairy starter cultures and their evaluation. Important analytical techniques in microbiology. New Food pathogens. Different processing treatments given to milk during its processing for fluid milk supply and manufacturing of different products. Chemistry and Microbiological during manufacture of dairy products.

Application of Advance Techniques and development of new Products in dairy processing, Bio preservation, Functional Foods. Judging of milk and milk products using physico- chemical, microbiological and sensory techniques. FSSAI and BIS standards of milk and milk products. Basic concept of dairy equipment used for liquid milk processing and manufacturing of different products. Cleaning and sanitization of dairy equipment. Conservation of resources. Packaging materials and techniques for milk and milk products. Recent trends in Food Packaging. Use of non-dairy ingredients during processing of milk and manufacturing of products. Quality and safety aspects of milk and milk products. Bio preservation. Functional Foods. Basic aspects of non-dairy food products.

### **RESEARCH METHODOLOGY:**

Information technology; library resource; internet databases and other packages; literature survey; web based resources and open access journals; digital libraries, manual collection; peer- review process, concept of impact factor and citation index; application of common softwares in food science research. Ethical issues; Plagiarism; Patenting Laws; Indian Patenting Act/International Protocols for technology transfer. Basic concepts of research; type and nature of research; research problem and objectives; formulation of hypotheses, types of hypotheses, methods of testing hypotheses; characteristics of good research problem; sources of research problem; errors in selecting a research problem; methods of research (Experimental, Survey, Observation, Case study, Historical and comparative methods); major emerging areas and interdisciplinary research. Designing research proposal and study; hypothesis; defining research problem, framing objective; Design strategies in research- experimental design: descriptive study, analytic study, experimental study, intervention trials; Safety issues- chemical hazards and their management. Methods of sampling; Data collection; tools and techniques; Data analysis and interpretation: Multivariate data analysis techniques, such as PCA, Cluster analysis, etc., data presentation and summarization of data; graphical presentation. Writing and publishing thesis/research paper; Editing and checking thesis/research paper for plagiarism. Formulating a Project proposal for funding.

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## **21. PhD in Development Studies (PHDDV)**

### **COURSE 1: DEVELOPMENT STUDIES: AN OVERVIEW (8 CREDITS)**

#### **BLOCK 1: DEVELOPMENT: AN OVERVIEW**

**Unit 1: Introduction to Development:** Why Development? Objectives and Scope of Development; development and growth; Development Ethics: Gandhi, Lebret, Myrdal and other ethical concepts

**Unit 2: Dimensions of Development:** Economic, Political, Social, Human, Cultural, Gender and Ethical Dimensions

**Unit 3: Development Paradigm:** Inclusive Development, Sustainable Development, Good Governance, International Relationship, Women Empowerment and Participatory Development Paradigms

**Unit 4: Actors of Development:** Markets, State and other Heterogeneous Actors such as international organization, and CVOs

#### **BLOCK 2: DEVELOPMENT THEORIES**

**Unit 1:** Classical and Neo-Classical Theories and Marxian theory

**Unit 2: Developmentalist Theories:** Balanced and Unbalanced Growth theories, Rostow's Stages of Economic Growth, Gunnar Myrdal theory

**Unit 3: Heterogeneous Theories:** Modernization theory, Human Capital Theory, Neo- Liberal Theory and Dependency Theories

#### **BLOCK 3: EDIFICES OF DEVELOPMENT**

**Unit 1: Development Governance:** meaning and scope of development governance; functions and components; features of good governance; attributes and challenges of good development governance

**Unit 2: Development Administration:** concept and meaning of development administration, scope of development administration, features of good development administration, and challenges of development administration

**Unit 4: Development Management:** meaning and concept of development management, aim and scope of development management; development management cycle and requisites of effective development management

## **BLOCK 4: DEVELOPMENTAL ISSUES AND CHALLENGES-I**

**Unit 1: Economic Challenges:** Poverty, Inequality, Inflation and Unemployment, Population and Development

**Unit 2: Social Challenges:** Conflict and Development, Displacement and Development, Marginalization, Social Disparities and Inclusion, Education and Health

**Unit 3: Emerging Challenges:** Globalization, Climate change, Social Clustering, Regional Development

## **BLOCK 5: DEVELOPMENT ISSUES AND CHALLENGES-II**

**Unit 1: Agriculture and Development: Role of agriculture, Issues and Challenges of agriculture, Measures to improve agriculture**

**Unit 2: Industry and Development:** Role of industry in development, Issues and Challenges of industrial Development, Industrial Development measures

**Unit 3: Service Sector and Development:** Role of Service Sector in Development, Issues and challenges of service sector, measures to strengthen service sector.

**Unit 4: Informal Sector and Development:** role of informal sector in development, measures to formalize the informal sector and challenges of informal sector

## **BLOCK 6: INDIAN DEVELOPMENT**

**Unit 1: Urban Development in India:** Urbanization, Issues and Challenges of Urbanization, Smart Cities

**Unit 2: Rural Development in India:** Components of Rural Development, Models of Rural Development, Issues and Challenges of Rural Development ,Smart Village, Rural Development measures

**Unit 3: Planning and Development in India:** Impact of planning before and after liberalization and NITI Ayyog

**Unit 5: Globalization and Development in India:** Globalization and its impact on the development in India



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## **COURSE 2: RESEARCH METHODOLOGY IN DEVELOPMENT STUDIES (8 CREDITS)**

	<b>BLOCKS</b>	<b>UNITS</b>
<b>Block-1</b>	Fundamentals of Social Science Research	1. Social Science Research-An Overview
		2. Component of Social Science Research
		3. Research Designs
		4. Research Project Formulation
<b>Block-2</b>	Development Research	1. Basic of Development Research
		2. Methods of Development Research
		3. Development Research Applications
<b>Block-3</b>	Measurement and Sampling	1. Measurement
		2. Scales and Tests
		3. Reliability and Validity
		4. Sampling
<b>Block-4</b>	Data Collection and Analysis-1	1. Quantitative Data Collection Methods and Devises
		2. Qualitative Data Collection Methods and Devises
		3. Overview of Statistical Tools
<b>Block -5</b>	Data Collection and Analysis-2	1. Data Sources-Uses and Limitations
		2. Data Processing and Analysis Report Writing
		<b>3. Report Writing</b>
		4. Use of Computer in Data Analysis

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## **22. PhD in Computer Science (PHDCS)**

### **PART – 1 (Research Methodology)**

Sets, Relations, Functions, Matrices and Determinants, Probability and Statistics, Descriptive and Inferential Statistics, Probability Distributions, Numerical Methods, Finite Differences, Numerical Integration.

### **PART – 2 (Computer Science)**

#### **1. Computer System Architecture**

Digital Logic Circuits and Components: Digital Computers, Logic Gates, Boolean Algebra, Map Simplifications, Combinational Circuits, Flip-Flops, Sequential Circuits, Integrated Circuits, Decoders, Multiplexers, Registers and Counters, Memory Unit.

Data Representation: Data Types, Number Systems and Conversion, Complements, Fixed Point Representation, Floating Point Representation, Error Detection Codes, Computer Arithmetic - Addition, Subtraction, Multiplication and Division Algorithms.

Register Transfer and Microoperations: Register Transfer Language, Bus and Memory Transfers, Arithmetic, Logic and Shift Microoperations.

Basic Computer Organization and Design: Stored Program Organization and Instruction Codes, Computer Registers, Computer Instructions, Timing and Control, Instruction Cycle, Memory-Reference Instructions, Input-Output, Interrupt.

Programming the Basic Computer: Machine Language, Assembly Language, Assembler, Program Loops, Subroutines, Input-Output Programming.

Microprogrammed Control: Control Memory, Address Sequencing, Design of Control Unit.

Central Processing Unit: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, RISC Computer, CISC Computer.

Pipeline and Vector Processing: Parallel Processing, Pipelining, Arithmetic Pipeline, Instruction Pipeline, Vector Processing Array Processors.

Input-Output Organization: Peripheral Devices, Input-Output Interface, Asynchronous Data Transfer, Modes of Transfer, Priority Interrupt, DMA, Serial Communication.

Memory Hierarchy: Main Memory, Auxillary Memory, Associative Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

Multiprocessors: Characteristics of Multiprocessors, Interconnection Structures, Interprocessor Arbitration, Interprocessor Communication and Synchronization, Cache Coherence, Multicore Processors.

## **2. Discrete Structures and Optimization**

Mathematical Logic: Propositional and Predicate Logic, Propositional Equivalences, Normal Forms, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference.

Sets and Relations: Set Operations, Representation and Properties of Relations, Equivalence Relations, Partially Ordering.

Counting, Mathematical Induction and Discrete Probability: Basics of Counting, Pigeonhole Principle, Permutations and Combinations, Inclusion- Exclusion Principle, Mathematical Induction, Probability, Bayes' Theorem.

Group Theory: Groups, Subgroups, Semi Groups, Product and Quotients of Algebraic Structures, Isomorphism, Homomorphism, Automorphism, Rings, Integral Domains, Fields, Applications of Group Theory.

Graph Theory: Simple Graph, Multigraph, Weighted Graph, Paths and Circuits, Shortest Paths in Weighted Graphs, Eulerian Paths and Circuits, Hamiltonian Paths and Circuits, Planner graph, Graph Coloring, Bipartite Graphs, Trees and Rooted Trees, Prefix Codes, Tree Traversals, Spanning Trees and Cut-Sets.

Boolean Algebra: Boolean Functions and its Representation, Simplifications of Boolean Functions.

Optimization: Linear Programming - Mathematical Model, Graphical Solution, Simplex and Dual Simplex Method, Sensitive Analysis; Integer Programming, Transportation and Assignment Models, PERT-CPM: Diagram Representation, Critical Path Calculations, Resource Levelling, Cost Consideration in Project Scheduling.

## **3. Programming Languages and Computer Graphics**

Language Design and Translation Issues: Programming Language Concepts, Paradigms and Models, Programming Environments, Virtual Computers and Binding Times, Programming Language Syntax, Stages in Translation, Formal Transition Models.

Elementary Data Types: Properties of Types and Objects; Scalar and Composite Data Types.

Programming in C: Tokens, Identifiers, Data Types, Sequence Control, Subprogram Control, Arrays, Structures, Union, String, Pointers, Functions, File Handling, Command Line Arguments, Preprocessors.

Object Oriented Programming: Class, Object, Instantiation, Inheritance, Encapsulation, Abstract Class, Polymorphism.

Programming in C++: Tokens, Identifiers, Variables and Constants; Data types, Operators, Control statements, Functions Parameter Passing, Virtual Functions, Class and Objects; Constructors and Destructors; Overloading, Inheritance, Templates, Exception and Event Handling; Streams and Files; Multifile Programs.

Web Programming: HTML, DHTML, XML, Scripting, Java, Servlets, Applets.

Computer Graphics: Video-Display Devices, Raster-Scan and Random-Scan Systems; Graphics Monitors, Input Devices, Points and Lines; Line Drawing Algorithms, Mid-Point Circle and Ellipse Algorithms; Scan Line Polygon Fill Algorithm, Boundary-Fill and Flood-Fill.

2-D Geometrical Transforms and Viewing: Translation, Scaling, Rotation, Reflection and Shear Transformations; Matrix Representations and Homogeneous Coordinates; Composite Transforms, Transformations Between Coordinate Systems, Viewing Pipeline, Viewing Coordinate Reference Frame, Window to View-Port Coordinate Transformation, Viewing Functions, Line and Polygon Clipping Algorithms.

3-D Object Representation, Geometric Transformations and Viewing: Polygon Surfaces, Quadric Surfaces, Spline Representation, Bezier and B-Spline Curves; Bezier and B-Spline Surfaces; Illumination Models, Polygon Rendering Methods, Viewing Pipeline and Coordinates; General Projection Transforms and Clipping.

#### **4. Database Management Systems**

Database System Concepts and Architecture: Data Models, Schemas, and Instances; Three-Schema Architecture and Data Independence; Database Languages and Interfaces; Centralized and Client/Server Architectures for DBMS.

Data Modeling: Entity-Relationship Diagram, Relational Model - Constraints, Languages, Design, and Programming, Relational Database Schemas, Update Operations and Dealing with Constraint Violations; Relational Algebra and Relational Calculus; Codd Rules.

SQL: Data Definition and Data Types; Constraints, Queries, Insert, Delete, and Update Statements; Views, Stored Procedures and Functions; Database Triggers, SQL Injection.

Normalization for Relational Databases: Functional Dependencies and Normalization; Algorithms for Query Processing and Optimization; Transaction Processing, Concurrency Control Techniques, Database Recovery Techniques, Object and Object-Relational Databases; Database Security and Authorization.

Enhanced Data Models: Temporal Database Concepts, Multimedia Databases, Deductive Databases, XML and Internet Databases; Mobile Databases, Geographic Information Systems, Genome Data Management, Distributed Databases and Client-Server Architectures.

Data Warehousing and Data Mining: Data Modeling for Data Warehouses, Concept Hierarchy, OLAP and OLTP; Association Rules, Classification, Clustering, Regression, Support Vector Machine, K-Nearest Neighbour, Hidden Markov Model, Summarization, Dependency Modeling, Link Analysis, Sequencing Analysis, Social Network Analysis.

Big Data Systems: Big Data Characteristics, Types of Big Data, Big Data Architecture, Introduction to Map-Reduce and Hadoop; Distributed File System, HDFS.

NOSQL: NOSQL and Query Optimization; Different NOSQL Products, Querying and Managing NOSQL; Indexing and Ordering Data Sets; NOSQL in Cloud.

## **5. System Software and Operating System**

System Software: Machine, Assembly and High-Level Languages; Compilers and Interpreters; Loading, Linking and Relocation; Macros, Debuggers.

Basics of Operating Systems: Operating System Structure, Operations and Services; System Calls, Operating-System Design and Implementation; System Boot.

Process Management: Process Scheduling and Operations; Interprocess Communication, Communication in Client-Server Systems, Process Synchronization, Critical-Section Problem, Peterson's Solution, Semaphores, Synchronization.

Threads: Multicore Programming, Multithreading Models, Thread Libraries, Implicit Threading, Threading Issues.

CPU Scheduling: Scheduling Criteria and Algorithms; Thread Scheduling, Multiple-Processor Scheduling, Real-Time CPU Scheduling.

Deadlocks: Deadlock Characterization, Methods for Handling Deadlocks, Deadlock Prevention, Avoidance and Detection; Recovery from Deadlock.

Memory Management: Contiguous Memory Allocation, Swapping, Paging, Segmentation, Demand Paging, Page Replacement, Allocation of Frames, Thrashing, Memory-Mapped Files.

Storage Management: Mass-Storage Structure, Disk Structure, Scheduling and Management, RAID Structure.

File and Input/Output Systems: Access Methods, Directory and Disk Structure; File- System Mounting, File Sharing, File-System Structure and Implementation; Directory Implementation, Allocation Methods, Free-Space Management, Efficiency and Performance; Recovery, I/O Hardware, Application I/O Interface, Kernel I/O Subsystem, Transforming I/O Requests to Hardware Operations.

Security: Protection, Access Matrix, Access Control, Revocation of Access Rights, Program Threats, System and Network Threats; Cryptography as a Security Tool, User Authentication, Implementing Security Defenses.

Virtual Machines: Types of Virtual Machines and Implementations; Virtualization.

Linux Operating Systems: Design Principles, Kernel Modules, Process Management, Scheduling, Memory Management, File Systems, Input and Output; Interprocess Communication, Network Structure.

Windows Operating Systems: Design Principles, System Components, Terminal Services and Fast User Switching; File System, Networking.

Distributed Systems: Types of Network based Operating Systems, Network Structure, Communication Structure and Protocols; Robustness, Design Issues, Distributed File Systems.

## **6. Software Engineering**

Software Process Models: Software Process, Generic Process Model – Framework Activity, Task Set and Process Patterns; Process Lifecycle, Prescriptive Process Models, Project Management, Component Based Development, Aspect-Oriented Software Development, Formal Methods, Agile Process Models – Extreme Programming (XP), Adaptive Software Development, Scrum, Dynamic System Development Model, Feature Driven Development, Crystal, Web Engineering.

Software Requirements: Functional and Non-Functional Requirements; Eliciting Requirements, Developing Use Cases, Requirement Analysis and Modelling; Requirements Review, Software Requirement and Specification (SRS) Document.

Software Design: Abstraction, Architecture, Patterns, Separation of Concerns, Modularity, Information Hiding, Functional Independence, Cohesion and Coupling; Object-Oriented Design, Data Design, Architectural Design, User Interface Design, Component Level Design.



Software Quality: McCall's Quality Factors, ISO 9126 Quality Factors, Quality Control, Quality Assurance, Risk Management, Risk Mitigation, Monitoring and Management (RMMM); Software Reliability.

Estimation and Scheduling of Software Projects: Software Sizing, LOC and FP based Estimations; Estimating Cost and Effort; Estimation Models, Constructive Cost Model (COCOMO), Project Scheduling and Staffing; Time-line Charts.

Software Testing: Verification and Validation; Error, Fault, Bug and Failure; Unit and Integration Testing; White-box and Black-box Testing; Basis Path Testing, Control Structure Testing, Deriving Test Cases, Alpha and Beta Testing; Regression Testing, Performance Testing, Stress Testing.

Software Configuration Management: Change Control and Version Control; Software Reuse, Software Re-engineering, Reverse Engineering.

## **7. Data Structures and Algorithms**

Data Structures: Arrays and their Applications; Sparse Matrix, Stacks, Queues, Priority Queues, Linked Lists, Trees, Forest, Binary Tree, Threaded Binary Tree, Binary Search Tree, AVL Tree, B Tree, B+ Tree, B\* Tree, Data Structure for Sets, Graphs, Sorting and Searching Algorithms; Hashing.

Performance Analysis of Algorithms and Recurrences: Time and Space Complexities; Asymptotic Notation, Recurrence Relations.

Design Techniques: Divide and Conquer; Dynamic Programming, Greedy Algorithms, Backtracking, Branch and Bound.

Lower Bound Theory: Comparison Trees, Lower Bounds through Reductions.

Graph Algorithms: Breadth-First Search, Depth-First Search, Shortest Paths, Maximum Flow, Minimum Spanning Trees.

Complexity Theory: P and NP Class Problems; NP-completeness and Reducibility.

Selected Topics: Number Theoretic Algorithms, Polynomial Arithmetic, Fast Fourier Transform, String Matching Algorithms.

Advanced Algorithms: Parallel Algorithms for Sorting, Searching and Merging, Approximation Algorithms, Randomized Algorithms.

## 8. Theory of Computation and Compilers

Theory of Computation: Formal Language, Non-Computational Problems, Diagonal Argument, Russels's Paradox.

Regular Language Models: Deterministic Finite Automaton (DFA), Non-Deterministic Finite Automaton (NFA), Equivalence of DFA and NFA, Regular Languages, Regular Grammars, Regular Expressions, Properties of Regular Language, Pumping Lemma, Non- Regular Languages, Lexical Analysis.

Context Free Language: Pushdown Automaton (PDA), Non-Deterministic Pushdown Automaton (NPDA), Context Free Grammar, Chomsky Normal Form, Greibach Normal Form, Ambiguity, Parse Tree Representation of Derivation Trees, Equivalence of PDA's and Context Free Grammars; Properties of Context Free Language.

Turing Machines (TM): Standard Turing Machine and its Variations; Universal Turing Machines, Models of Computation and Church-Turing Thesis; Recursive and Recursively-Enumerable Languages; Context-Sensitive Languages, Unrestricted Grammars, Chomsky Hierarchy of Languages, Construction of TM for Simple Problems.

Unsolvable Problems and Computational Complexity: Unsolvable Problem, Halting Problem, Post Correspondence Problem, Unsolvable Problems for Context-Free Languages, Measuring and Classifying Complexity, Tractable and Intractable Problems.

Syntax Analysis: Associativity, Precedence, Grammar Transformations, Top Down Parsing, Recursive Descent Predictive Parsing, LL(1) Parsing, Bottom up Parsing, LR Parser, LALR(1) Parser.

Semantic Analysis: Attribute Grammar, Syntax Directed Definitions, Inherited and Synthesized Attributes; Dependency Graph, Evaluation Order, S-attributed and L-attributed Definitions; Type-Checking.

Run Time System: Storage Organization, Activation Tree, Activation Record, Stack Allocation of Activation Records, Parameter Passing Mechanisms, Symbol Table.

Intermediate Code Generation: Intermediate Representations, Translation of Declarations, Assignments, Control Flow, Boolean Expressions and Procedure Calls.

Code Generation and Code Optimization: Control-flow, Data-flow Analysis, Local Optimization, Global Optimization, Loop Optimization, Peep-Hole Optimization, Instruction Scheduling.

## **9. Data Communication and Computer Networks**

Data Communication: Components of a Data Communication System, Simplex, Half- Duplex and Duplex Modes of Communication; Analog and Digital Signals; Noiseless and Noisy Channels; Bandwidth, Throughput and Latency; Digital and Analog Transmission; Data Encoding and Modulation Techniques; Broadband and Baseband Transmission; Multiplexing, Transmission Media, Transmission Errors, Error Handling Mechanisms.

Computer Networks: Network Topologies, Local Area Networks, Metropolitan Area Networks, Wide Area Network, Wireless Networks, Internet.

Network Models: Layered Architecture, OSI Reference Model and its Protocols; TCP/IP Protocol Suite, Physical, Logical, Port and Specific Addresses; Switching Techniques.

Functions of OSI and TCP/IP Layers: Framing, Error Detection and Correction; Flow and Error Control; Sliding Window Protocol, HDLC, Multiple Access – CSMA/CD, CSMA/CA, Reservation, Polling, Token Passing, FDMA, CDMA, TDMA, Network Devices, Backbone Networks, Virtual LANs.

IPv4 Structure and Address Space; Classful and Classless Addressing; Datagram, Fragmentation and Checksum; IPv6 Packet Format, Mapping Logical to Physical Address (ARP), Direct and Indirect Network Layer Delivery; Routing Algorithms, TCP, UDP and SCTP Protocols; Flow Control, Error Control and Congestion Control in TCP and SCTP.

World Wide Web (WWW): Uniform Resource Locator (URL), Domain Name Service (DNS), Resolution - Mapping Names to Addresses and Addresses to Names; Electronic Mail Architecture, SMTP, POP and IMAP; TELNET and FTP.

Network Security: Malwares, Cryptography and Steganography; Secret-Key Algorithms, Public-Key Algorithms, Digital Signature, Virtual Private Networks, Firewalls.

Mobile Technology: GSM and CDMA; Services and Architecture of GSM and Mobile Computing; Middleware and Gateway for Mobile Computing; Mobile IP and Mobile Communication Protocol; Communication Satellites, Wireless Networks and Topologies; Cellular Topology, Mobile Adhoc Networks, Wireless Transmission and Wireless LANs; Wireless Geolocation Systems, GPRS and SMS.

Cloud Computing and IoT: SaaS, PaaS, IaaS, Public and Private Cloud; Virtualization, Virtual Server, Cloud Storage, Database Storage, Resource Management, Service Level Agreement, Basics of IoT.

## **10. Artificial Intelligence (AI)**

Approaches to AI: Turing Test and Rational Agent Approaches; State Space Representation of Problems, Heuristic Search Techniques, Game Playing, Min-Max Search, Alpha Beta Cutoff Procedures.

Knowledge Representation: Logic, Semantic Networks, Frames, Rules, Scripts, Conceptual Dependency and Ontologies; Expert Systems, Handling Uncertainty in Knowledge.

Planning: Components of a Planning System, Linear and Non Linear Planning; Goal Stack Planning, Hierarchical Planning, STRIPS, Partial Order Planning.

Natural Language Processing: Grammar and Language; Parsing Techniques, Semantic Analysis and Pragmatics.

Multi Agent Systems: Agents and Objects; Agents and Expert Systems; Generic Structure of Multiagent System, Semantic Web, Agent Communication, Knowledge Sharing using Ontologies, Agent Development Tools.

Fuzzy Sets: Notion of Fuzziness, Membership Functions, Fuzzification and Defuzzification; Operations on Fuzzy Sets, Fuzzy Functions and Linguistic Variables; Fuzzy Relations, Fuzzy Rules and Fuzzy Inference; Fuzzy Control System and Fuzzy Rule Based Systems.

Genetic Algorithms (GA): Encoding Strategies, Genetic Operators, Fitness Functions and GA Cycle; Problem Solving using GA.

Artificial Neural Networks (ANN): Supervised, Unsupervised and Reinforcement Learning; Single Perceptron, Multi Layer Percept

#### Question Paper Pattern for PHDCS Entrance Exam

- (i) Question Paper consists of 100 MCQ's comprising two parts (Part I: Research Methodology, 50 MCQ's of 50 marks and Part II: Computer Science, 50 MCQ's of 50 marks)
- (ii) Both, Part I and Part II are compulsory.
- (iii) Use of Scientific Calculator/ any Calculator will be allowed.
- (iv) For each correct answer 1 mark will be awarded.

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## 23. PhD in Law (PHDLE)

### Part A- Research Methodology

#### 1. (a) Nature of Research

- What is Research?
- Relevance of Legal Research
- Objective of Legal Research.
- Need for Legal Research and Importance of inter-disciplinary approach.
- Significance of Legal Research in India.
- Legal Research as a profession in India.

#### (b) Types of Research

- Doctrinal or Traditional Research.
- Non-doctrinal or Empirical Research.
- Descriptive and Analytical Research.
- Applied and Fundamental Research.
- Qualitative and Quantitative Research.
- Law Reform Research.
- Historical Research.
- Sociological Research.

#### 2. Research Processes

- Identification of Research Problems.
- Review of Literature.
- Selection of a Research Problem
- Formulation of a Hypothesis.
- Research Design.
- Hypothesis.

#### 3. Research Methods and tools for collection of data

##### 1) Primary Data method.

- Experimental and Participatory/ Scientific Method.
- Case Study Method.
- Survey Method.
- Discussion Method.
- Observation Method.
- Interview Method.
- Mail Survey Method.
- Questionnaire (Open ended and Close ended)
- Pilot Study Method.

##### 2) Secondary Data Method.

- Case Law Method.
- Cumulative Record Cards.

### 3) **Tabulation and Evaluation of Data.**

#### 4. **Sampling**

- Advantages and Limitations of Sampling.
- Theoretical basis of Sampling
  - Probability and Non- probability Sampling
- Classifications of sampling
  - Simple Random Sampling
  - Stratified Sampling
  - Cluster Sampling
  - Systematic Sampling
  - Non- random sampling
  - Purposive Sampling
  - Convenience Sampling
  - Judgment Sampling
- Sampling and Non- sampling Error.

#### 5. **Analysis and Interpretation of Data**

- Application of Content Analysis in Legal Research.
- Analysis of aggregate Data.
- Data Interpretation.
- Legal input Analysis, the ideal and the practicable.
- Data Processing- Summarizing of data, Codification and Tabulation.
- Writing a Research Report- Types, Contents and steps involved in drafting of a Report.

#### 6. **Scientific Tools in Research**

- Jurimetrics.
- Use of SPSS and other packages in Legal research.
- Avoiding/Detecting plagiarism.
- Writing the research report/Bibliography/Presentation styles

#### 7. **Other Legal Research Strategies:**

- Legislative materials including subordinate legislation, notification and policy statements.
- Decisional material including foreign decisions; methods of discovering the "rule of the case" - tracing the history of important cases and also to ensuring that the case had not been overruled.
- Survey of juristic literature/ writings and its importance in selecting research problem.
- Compilation of list of reports used or special studies conducted relevant to the problem.
- Finding Material in a Law Library: Books, Journals, Law Reports and Digests of cases , Acts, Index to Periodicals.
- Mode of Citation and Bibliography: Author- date System, Footnote and Endnote System, Citing for the First Time, Subsequent citing, List of Abbreviations Used in Citation, Bibliographical Entries, The Blue book - A Uniform System of Citation.

## **Part B – Law**

### **1. Constitutional Law of India**

- Preamble
- Fundamental Rights and Duties.
- Directive Principles of State Policy.
- Judiciary.
- Executive.
- Union State Legislative Relations.
- Emergency Provisions.
- Amendment to the Constitution of India.
- Writ Jurisdiction.

### **2. Legal Theory**

- Nature and Source of Law.
- Positivism, Natural Law Theory, Sociological Jurisprudence.
- Theories of punishment.
- Rights and Duties.
- Concepts of Possession and Ownership.
- Judicial Process and Social Transformation.
- Judicial Activism.
- Social Justice.

### **3. 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.

### **4. Law of Contracts: General Principles**

- Essentials of a valid contract.
- Offer, acceptance and consideration.
- Capacity to Contract: Minor's contract.
- Elements vitiating contract: Mistake, fraud, misrepresentation, public policy, coercion, undue influence, frustration of contract.
- Remedies for breach of contract: Damages.

## 5. Law of Crimes: General Principles

- Nature and Definition of Offence.
- General Exceptions
- Common Intention and Common Object.
- Criminal Attempt, Conspiracy and Abetment.
- Offences against Women and child

## 6. Law of Torts

- Foundation of Tortious Liability.
- General Defences to an action of Tort.
- Vicarious Liability
- Remoteness of Damages.
- Negligence
- Absolute and Strict Liability.

## 7. Environmental law

- Concept of Environment- Meaning of Environment and Environmental Pollution
- Environment law for the Prevention and Control of Environmental Pollution in India  
:
  - The Water ( Prevention and Control of Pollution) Act 1974;
  - The Air ( Prevention and Control of Pollution) Act 1981;
  - Wildlife protection Act,1972
  - Environment protection Act, 1986.
- International Development for protection of Environmental Pollution.
- Remedies for Environmental Protection: Civil, Criminal and Constitutional.
- Environmental impact assessment and control of Hazardous wastes.

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## **24. PhD in Nursing (PHDNS)**

Syllabus for entrance test is based on M.Sc Nursing curriculum with following details:

Research Methodology and Statistics 50 Marks

Nursing management 20 Marks

Nursing Education 20 Marks

Specialization area of Nursing 10 Marks

(Medical Surgical Nursing/Pediatric Nursing /Obstetric and Gynecology Nursing/

Community Health Nursing/Mental Health and psychiatric Nursing)

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## **25. Ph.D. in Social Work (PHDSW)**

### ***Part –A: Research Methodology***

- Basics of research in social work
- Research methods in social work
- Tools and methods of data collection
- Data processing and analysis

### ***Part –B: Social Work***

- Origin and Development of Social Work
- Professional Social Work: Indian Perspectives
- Basic Social Science Concepts
  
- Social Work and Social Development
- Social Work Practicum and Supervision
- Social Work Research
- Social Work Practicum
- Case Work and Counseling: Working with Individuals
- Social Group Work: Working with Groups
- Community Organization Management for Community Development

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## 26. PhD in Translation Studies (PHDTT)

- **Research Methodology**

- Definitions of Research
- Objectives of Research
- Types of Research
- Significance of Research
- Preparing Research proposal
- Research Approaches
- Stages of Report writing
- Using Library resources
- Style Sheets
- Data collection and Data Analysis

- **Translation Studies**

- Meaning, Definitions, Nature and Scope of Translation
- History of Translation: Western & Indian
- Translation Studies: Development of Discipline
- Colonial Translation and Post Colonial Translation
- Thinkers of Translation: Nida, J.C. Catford, George Steiner, Itamar E Zohar, Andre Lefevere

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Note:

- Nature of Questions-Multiple Choice Questions
- Total Number of Questions-100, (50 Questions on Research Methodology, 50 Questions on Translation Studies)
- There shall be no Negative Marking

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## 27. PhD in Vocational Education and Training (PHDVE)

The syllabus of the Entrance Test shall consist of 50% of research methodology and 50% shall be of Vocational education and training

### **Part-A: Research Methodology**

**Introduction to research:** meaning of research, role research in behavioral sciences, process of research, types of research, research approach and significance of research.

**Formulation of a Research Problem:** Research problem: definition, selection and necessity of research problem.

**Data Collection Methods:** Primary and secondary data, methods of collecting primary data, merits and demerits of different methods of collecting primary data, non-response.

**Data Collection Techniques:** Designing a questionnaire, pretesting a questionnaire, editing of primary data, technique of interview, collection of secondary data, scrutiny of secondary data, scale of measurements.

**Sampling Techniques:** Introduction to sampling, advantage of sampling over census, probability and non-probability sampling and non-sampling error, basics of simple random sampling, stratified random sampling, systematic sampling, and multistage sampling.

**Presentation of Data:** Classification and tabulation of data diagrammatic and graphical presentation of data.

**Statistical Methods:** Measure of Central tendency, measures of dispersion, simple correlation and regression, testing of hypothesis (z, t, F and chi-square tests), Interpretation of data.

**Report writing:** Formation of Report, Presentation of a report

### **Part B: Vocational Education and Training**

**Vocational Education** (for Human Resource Development for National Development, for Knowledge Economy, for Development of Marginalized Sections of the Society, for Persons with Special Needs, Personal/Family Actualisation and Happiness).

**International Experiences:** Review of International Reports (UNESCO's Report of the International Commission on Education for the Twenty-First Century "Learning: The Treasure Within, Second International Congress on Technical and Vocational Education, Report on Knowledge Acquisition and Skill Development (UNESCO)), International Experiences in Vocational Education (Germany, China, Korea, Japan, Switzerland, Australia, New Zealand).

**Growth and Development in India:** Historical Background of Vocational Education in India (Pre-Independence Period, Post-Independence Period), Impact of Globalization and Liberalization on Vocational Education. Recent Government of India initiatives on Vocational education, NSOF, VET programmes through formal non-formal modes.

**Initiatives by Different Sectors of India:** Education Sector (CBSE, State Boards, NIOS and State Open Schools, Community Polytechnics, Jan Shikshan Sansthan, Community Colleges, Degree Colleges and Universities, Open Universities, NCERT and PSSCIVE), Industrial Sector (Craftsman Training Scheme, Apprenticeship Training Scheme, Skill Development Initiative),

Health and Paramedical Sector, Agriculture Sector, Business and Commerce Sector, Information and Communication Sector, Role and Work of Non-Governmental Organizations.

**Models of Vocational Education and Training:** School Based Model (Introduction of VEP in Schools, Thrust Areas Identified by NPE (1986) for VEP, Centrally Sponsored Scheme of Vocationalisation of Education, Programme of Action (POA, 1992), Industry Based Model (Vocational Training Programmes), Community Colleges Scheme, Apprenticeship.

**Issues in Vocational Educational and Training:** Social Acceptability, Access, Terminal Nature of Courses, Employability, Multi-Skilling, Managing a Small Enterprise, Remunerative Structure (wages and earnings) of Vocationally trained person

Relevance, Untrained Vocational Teachers, On the Job Training, Apprenticeship Training Assessment and Certification of Prior Learning, Connectivity among Vocational programmes at All Levels, Lateral and Vertical Mobility.

**Environmental consciousness and Sustainable Development:** Understanding Environment, Environmental Concerns, Environmental Problems and Issues, Major Environmental Problems, Global Environmental Issues (Global Warming, Acid Rain, Ozone Layer Depletion), Environmental Resources (Forest Resources, Land Resources, Water Resources, Animal Resources).

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## **28. PhD in French (PHDFL)**

- Research methodology : Approaches and categories/types of research; selection of subject; research design; sampling techniques; data gathering, fieldwork, primary & secondary sources, questionnaires and data collection tools , data analysis, quantitative and qualitative analysis, referencing and annotation: research ethics.
- French and francophone literature (17<sup>th</sup>-20<sup>th</sup> century); Linguistics ; Theories of translation & Interpretation; Didactics of foreign languages with emphasis on FLE: Trends and Theories; History, Culture & Civilization of France (17<sup>th</sup>-20<sup>th</sup> century), Current contexts in socio political trends in France; Francophonie : history, culture and literary trends; introduction to Open and Distance learning – FOAD., Popular culture in France : art, cinema & theatre.

**\*\*\*BEST WISHES \*\*\***