Central University of Punjab

Bathinda

MINUTES

of

19th Meeting

of the

EXECUTIVE COUNCIL

15th December 2015

Contents

PROCEEDINGS of
NINETEENTH MEETING OF THE EXECUTIVE COUNCIL
HELD IN BATHINDA ON 15th December, 2015

Nineteenth Meeting of the Executive Council was held on 15th December 2015 at 9:00 a.m. in the Conference Room, Administrative Block, Central University of Punjab, Bathinda. The following members attended the meeting:

1)	Prof. R. K. Kohli, Vice Chancellor	:	Chairman
2)	Prof. P. Ramarao	:	Member
3)	Dr. Zameerpal Kaur	:	Member
4)	Dr. Pankaj Khare	:	Secretary

Er. Sham Lal Garg and Prof. T. A. Gonsalves expressed their inability to attend the meeting. Prof. R. C. Sobti and Prof. A. D. N. Bajpai could not personally attend the meeting due to urgent prefixed engagements in their respective universities, but they had sent their observations/comments/approvals to the items on the agenda.

The Chairman called the meeting in order and welcomed the members and thanked them for sparing their time.

The Secretary informed the Chair that as per the amended Ordinance on EC, for the quorum to be complete, we need at least 2 external members. He brought to the notice of the EC that Prof. R. C. Sobti and Prof. A. D. N. Bajpai have sent their comments/approvals on the Agenda in writing through emails as they are not in a position to attend the meeting in person this time. Further he shared that Mr. Vijay Inder Singla is on his way to the meeting

The Secretary requested the Chair to adjourn the meeting. The Chairman, in view of the technicality involved especially due to the convocation, adjourned the meeting for 10 minutes – till 9:10 AM.

Registrar

The Vice Chancellor authorised the Registrar to convene the Adjourned Meeting at 9:10 Hrs. on 15th December 2015.

20/1/16

Vice Chancellor

PROCEEDINGS of
NINETEENTH MEETING OF THE EXECUTIVE COUNCIL
HELD IN BATHINDA ON 15th December, 2015

The Chairman requested the Secretary to call the adjourned meeting at 9:10 a.m.

The adjourned Nineteenth Meeting of the Executive Council was held on 15th December 2015 at the Conference Room, Administrative Block, Central University of Punjab, Bathinda. The following members attended the meeting:

1)	Prof. R. K. Kohli, Vice Chancellor	:	Chairman
2)	Sh. Vijay Inder Singla	:	Member
3)	Prof. P. Ramarao	:	Member
4)	Dr. Zameerpal Kaur	:	Member
5)	Dr. Pankaj Khare	:	Secretary
6)	Prof. R. C. Sobti	:	**Participation *in absentia***
7)	Prof. A. D. N. Bajpai	:	***Item wise comments received through email put up in meeting***

Er. Sham Lal Garg and Prof. T. A. Gonsalves expressed their inability to attend the meeting Prof. R. C. Sobti and Prof. A. D. N. Bajpai could not personally attend the meeting due to urgent prefixed engagements in their respective universities, but they had sent their observations/comments/approvals to the items on the agenda.

The Chairman called the meeting in order and welcomed the members and thanked them for sparing their time.

The Chairman then requested the Secretary to present the Agenda Items to the Members for deliberations and decisions. Secretary, Dr. Pankaj Khare presented the Items in sequence.

Item: EC:19:2015:1

To confirm the minutes of the Eighteenth Meeting of Executive Council held on 31st October 2015.

The Secretary submitted to the EC that the minutes of the Eighteenth Meeting of Executive Council were circulated to all the members and no comments were received on the EC Minutes.

RESOLVE

Executive Council with due deliberations, resolved unanimously to confirm the minutes of its Eighteenth Meeting held on 31st October 2015.

Item: EC:19:2015:2

To accept the Actions Taken Report (ATR) on the decisions of Eighteenth

The Secretary presented the details of the actions taken on the decisions taken by the Executive Council in its Eighteenth Meeting as placed at Annexure-19.1

Annexure-19.1

Meeting of Executive Council held on 31st October 2015.

RESOLVE

Executive Council expressed its satisfaction on the Actions Taken and resolved to accept the ATR.

Item: EC:19:2015:3

To consider Report of the Vice Chancellor on the progress of the University.

The Vice-Chancellor presented the progress of the University since the last Meeting of the Executive Council. A detailed presentation through PPt was made on various activities leading to the growth of the university. The presentation is **annexed at 19.2.** *Annexure-19.2*

RESOLVE

Executive Council after discussions appreciated the progress of the University and unanimously resolved to accept the report as placed at Annexure-19.2 *Annexure-19.2*

Item: EC:19:2015:4

Deferred Item of 18th EC Item:18:2015:30 ADDON AGENDA

18.i To consider the appointment in the Centre for Comparative Literature for the post of Associate Professors

As the matter was related to appointment of Associate Professors for Centre for Comparative Literature and as Dr. Zameerpal Kaur was a candidate, she left the meeting until the item was discussed.

The Secretary informed the members that this item was earlier placed in the 18th meeting of the Executive Council held on 31st October 2015, wherein the EC was not sure of the experience required for the position in one of the recommended candidates. EC had desired to verify the eligibility conditions of both the recommended candidates on count of educational qualifications, experience and API scores and had resolved that the findings be placed in the next EC meeting.

He further submitted that in view of the resolve of the Executive Council, a committee, headed by Dean Academic Affairs Prof. P. Ramarao, checked the eligibility conditions of both the recommended candidates on count of educational qualifications,

experience and API scores and verified the eligibility of both the candidates for the post of Associate Professor as recommended by the selection committee.

The Chairman presented the verification report findings of the committee before the members of the EC. (Annexure-19.3). *Annexure-19.3*

RESOLVE

The Executive Council considered the Report of the Committee that verified the eligibility of both the candidates for the post of Associate Professor in the Centre for Comparative Literature, as recommended by Selection Committee. The Executive Council further resolved to approve to offer Letter of Appointment to the following applicants as recommended by the Selection Committee in the order of Merit as Associate Professors in the Centre for Comparative Literature in the Scale Rs. 37,400—67,000 with Grade Pay of Rs. 9,000/- and fix the salary as per rules:- *Annexure-19.3*

1. **Dr. Zameerpal Kaur**
2. **Dr. Parneet Jaggi**

Item: EC:19:2015:5

To consider the case of appointment of Ms. Poonam Rani as UDC.

The Secretary apprised the members the case of appointment of Ms. Poonam Rani. While elucidating, he told that this case was earlier deliberated in the 14th meeting of the Executive Council, vide Item No. EC:14:2015:1C, wherein Executive Council resolved to give a fair chance to Ms. Poonam Rani to defend her eligibility for the post of UDC through a written communication and in case, the response is not satisfactory, a single person enquiry committee (by a Retired Judge) may be constituted by the Vice Chancellor to verify the facts of the case for suitable recommendations to EC.

The OSD (Finance) was assigned the responsibility to study the case and submit the report. On basis of the Report of OSD (Finance), a Show Cause Notice was issued to Ms. Poonam Rani on 22nd May 2015. She filed a reply on 9th June 2015 and denied all the charges levelled on her. The reply was presented to Executive Council in its 16th Meeting (Annexure-19.4). *Annexure-19.4*

He further informed that the Executive Council in its 16th meeting resolved to initiate an inquiry against Ms. Poonam Rani as per CCS Rules.

The Registrar issued a charge sheet to Ms. Poonam Rani on 21st October 2015 (Annexure-19.5). She requested for extension of reply against charge sheet, which was denied as it was requested without any specific reason. *Annexure-19.5*

In response to the charge sheet, Ms. Poonam Rani submitted her reply on 4th November 2015 as annexed at 19.6. In her reply attached, she denied each article of the Charge sheet. *Annexure-19.6*

RESOLVE

The Council after a detailed deliberation **resolved to take a legal opinion in this case. Further, it was resolved to take an early decision in the matter, in consonance with legal opinion, so that the necessary further action be taken before next EC is scheduled.**

Item: EC:19:2015:6

Sub Item: 6.1 to 6.27

To consider the proceedings of the Standing Committee for making recommendation of Non-compounded PhD increments to the faculty of CUP

The Secretary presented the proceedings of the Standing committee for making recommendation of Non-compounded PhD increments to the faculty of CUPB as attached at Annexure-19.7. *Annexure 19.7*

The sub items from 6.1 to 6.27 being similar were taken together.

After detailed discussion on the rules and regulations of the UGC and the recommendations of Standing Committee, the Executive Council opined that the requisite PhD/M.Phil./LL.M. increments should be given to following eligible applicants as per the details given:

Five Non-Compounded Increments to:

1. Dr. Rajendra Singh Dhayal
2. Dr. Sachin Kumar
3. Dr. Krishna Kanta Haldar
4. Dr. Anoop Kumar
5. Dr. Shashank Kumar
6. Dr. Ajay Kumar
7. Dr. Jainendra Kumar Verma

8. Dr. Dinesh Babu P.
9. Dr. Pradeep Kumar
10. Dr. Surender Mehra (subject to the production of certificate from BHU stating that he has not claimed these at BHU).
11. Dr. Sasang Guite
12. Dr. Jajati Keshari Parida

Three Non-Compounded Increments to:

1. Dr. Jitendra Kumar (Two additional non-compounded increments be given after submission of proof by the candidate that he has completed PhD with Course Work)
2. Dr. Sabyasachi Senapati (Two additional non-compounded increments be given after submission of proof by the candidate that he has completed PhD with Course Work)
3. Dr. Jyoti Parkash
4. Dr. Rakesh Kumar
5. Dr. Ashok Kumar
6. Dr. Sesadeba Pany
7. Dr. Krishna Chaitanya Rupali
8. Dr. Neeraj Kumar
9. Dr. Vinay Kumar
10. Dr. Milankumar Sharma
11. Dr. Vinod Arya
12. Dr. Sudheer Singh
13. Dr. Jubilee Padmanabhan
14. Dr. Sukhwinder Kaur

Two Non-Compounded Increments to:

1. Mr. Aditya Ranjan Kapoor (For M.Phil. Degree)
2. Dr. Sukhwinder Kaur (For LL.M. Degree)

Those, whose pay of the last employment was protected, have to certify/produce evidence that they did not claim the increments earlier.

RESOLVE

The Executive Council resolved to approve the proposed Non-compounded PhD/M.Phil./LL.M. increments to the eligible applicants covered under sub items of this item at Sr. No. 6.1 to 6.27 of Agenda as per Annexure-19.7 and as given below: *Annexure-19.7*

Five Non-Compounded Increments to:

1. Dr. Rajendra Singh Dhayal
2. Dr. Sachin Kumar
3. Dr. Krishna Kanta Haldar
4. Dr. Anoop Kumar
5. Dr. Shashank Kumar
6. Dr. Ajay Kumar
7. Dr. Jainendra Kumar Verma
8. Dr. Dinesh Babu P.
9. Dr. Pradeep Kumar
10. Dr. Surender Mehra (subject to the production of certificate from BHU stating that he has not claimed these at BHU).
11. Dr. Sasang Guite
12. Dr. Jajati Keshari Parida

Three Non-Compounded Increments to:

1. Dr. Jitendra Kumar (Two additional non-compounded increments be given after submission of proof by the candidate that he has completed PhD with Course Work)
2. Dr. Sabyasachi Senapati (Two additional non-compounded increments be given after submission of proof by the candidate that he has completed PhD with Course Work)
3. Dr. Jyoti Parkash
4. Dr. Rakesh Kumar
5. Dr. Ashok Kumar
6. Dr. Sesadeba Pany
7. Dr. Krishna Chaitanya Rupali
8. Dr. Neeraj Kumar
9. Dr. Vinay Kumar
10. Dr. Milankumar Sharma
11. Dr. Vinod Arya
12. Dr. Sudheer Singh
13. Dr. Jubilee Padmanabhan
14. Dr. Sukhwinder Kaur

Two Non-Compounded Increments to:

1. Mr. Aditya Ranjan Kapoor (For M.Phil. Degree)
2. Dr. Sukhwinder Kaur (For LL.M. Degree)

Item: EC:19:2015:7

Sub Item: 7.1 to 7.7

To consider the amended drafts of Ordinance II-VII and XXI of the university

The Secretary informed the members that CUPB prepared its ordinances and after approval of the Council, they were sent to MHRD for kind approval of the Visitor on dated 11.05.2012.

MHRD vide letter No. F 50-4/2012-Desk (U) dated 20.02.2013 informed that the Ordinance Nos. II-VII, XXI, XXIII-XXV of the university were not considered by the Govt. as the University Grants Commission made some suggestions, which needs to be complied by the Central University of Punjab.

He further informed that the university incorporated the suggestions made by UGC and amended the ordinance accordingly.

The sub items from Sr. 7.1 to 7.7 being similar were taken together as given below:

7.1 The amended draft Ordinance-II *Emoluments, Terms and Conditions of Service of the Vice Chancellor*, after incorporating following suggestions of UGC (also placed at Annexure-19.8): ***Annexure-19.8***

Para 3.2 of the ordinance "*The Vice Chancellor shall be entitled to such other facilities as may be decided by the university.*" **has been deleted** as per letter No. 50-4/2012-Desk(U) of MHRD.

7.2 The amended draft Ordinance-III *Emoluments, Terms and Conditions of Service of the Pro Vice Chancellor*, after incorporating following suggestions of UGC (also placed at Annexure-19.9): ***Annexure-19.9***

Para 3.2 of the ordinance "*The Pro Vice Chancellor shall be entitled to such other facilities as may be decided by the university.*" **has been deleted** as per letter No. 50-4/2012-Desk(U) of MHRD.

7.3 The amended draft Ordinance-IV *Emoluments, Terms and Conditions of Service of the Registrar*, after incorporating following suggestions of UGC (also placed at Annexure- ***Annexure-19.10***

19.10):

Para 3.1 of the ordinance "*The Registrar shall be entitled to free unfurnished residential accommodation.*" **has been replaced with** "*The Registrar shall be entitled to unfurnished residential accommodation for which he/she shall pay prescribed license fee.*"

Para 3.2 of the ordinance "*The Registrar shall be entitled to such other facilities as may be decided by the university.*" **has been deleted** as per letter No. 50-4/2012-Desk(U) of MHRD.

7.4 The amended draft Ordinance-V *Emoluments, Terms and Conditions of Service of the Finance Officer*, after incorporating following suggestions of UGC (also placed at Annexure-19.11): ***Annexure-19.11***

Para 3.1 of the ordinance "*The Finance Officer shall be entitled to free unfurnished residential accommodation.*" **has been replaced with** "*The Finance Officer shall be entitled to unfurnished residential accommodation for which he/she shall pay prescribed license fee.*"

Para 3.2 of the ordinance "*The Finance Officer shall be entitled to such other facilities as may be decided by the university.*" **has been deleted** as per letter No. 50-4/2012-Desk(U) of MHRD.

7.5 The amended draft Ordinance-VI *Emoluments, Terms and Conditions of Service of the Controller of Examinations*, after incorporating following suggestions of UGC (also placed at Annexure-19.12): ***Annexure-19.12***

Para 3.1 of the ordinance "*The Controller of Examinations shall be entitled to free unfurnished residential accommodation.*" **has been replaced with** "*The Controller of Examinations shall be entitled to unfurnished residential accommodation for which he/she shall pay prescribed license fee.*"

Para 3.2 of the ordinance "*The Controller of Examinations shall be entitled to such other facilities as may be decided by the university.*" **has been deleted** as per letter No. 50-4/2012-Desk(U) of MHRD.

7.6 The amended draft Ordinance-II *Emoluments, Terms and Conditions of Service of the Librarian*, after incorporating following suggestions of UGC (also placed at Annexure-19.13): ***Annexure-19.13***

Para 3.1 of the ordinance "*Librarian shall be entitled to such facilities as may be decided by the university.*" **has been deleted** as per letter No. 50-4/2012-Desk(U) of MHRD.

7.7 The amended draft Ordinance-VII *Procedure/Norms for Appointment to the Faculty Positions*, after incorporating following suggestions of UGC (also placed at Annexure-19.14): ***Annexure-19.14***

Para 13. of the ordinance "*The University will have the right to relax any of the qualifications, such as experience, minimum marks, age, etc. in deserving cases and it shall be ratified by the Selection Committee and the same shall be so stated and recorded.*" **has been deleted** as per letter No. 50-4/2012-Desk(U) of MHRD.

RESOLVE

The Council discussed each case of amendment of the draft Ordinance and resolved to approve the proposed amendments in the draft Ordinances covered under sub items of this item at Sr. No. 7.1 to 7.7 as per Annexure-19.8 to 19.14 respectively. ***Annexure-19.8—19.14***

Item: EC:19:2015:8

To consider the amended draft of Chapter 1, Statute: Schools of Studies and Centres

The Secretary apprised the members that the Visitor, vide letter No. F 42-26/2009-Desk (U) dated 16th March 2011 from MHRD, approved the CUPB Statute (Chapter 1) related to Schools of Studies and Centres.

As resolved by the Executive Council in its 15th meeting vide Item No. EC:15:15:12 and in its 17th

meeting vide Item No. EC:17:2015:10, some changes were made in above Statute (Chapter 1) Schools of Studies and Centres.

The amended draft of Chapter 1 of the Statute: Schools of Studies and Centres, after incorporating the suggestion made by the Executive Council, were presented before the EC as annexed at 19.15. *Annexure 19.15*

RESOLVE

After discussion, the Executive Council resolved to approve the draft of Chapter 1, Statute: Schools of Studies and Centres as proposed under Annexure-19.15. *Annexure 19.15*

Item: EC:19:2015:9

To note the confirmation of the Non-Teaching Staff who have/are going to complete their probation w.e.f their date of completion of two years.

The Secretary submitted that the probation period for newly appointed Non-teaching staff is of two years from the date of joining.

The Non-Teaching Staff members who have completed/or going to complete their period of probations were requested to fill the probation report. Their probation report was then forwarded to the reporting and reviewing officers for recommendations on lifting of their probation. Committees were then constituted by Vice Chancellor to recommend on each cases individually.

The committees after considering the recommendations of the reporting and reviewing officers recommended the lifting of the probations of the Non-Teaching Staff members w.e.f. the date of completion of their respective probation period.

Secretary presented the details of such Non-Teaching employees whose probation is recommended for lifting as placed at Annexure-19.16 for consideration of the EC. The details showing the respective date of confirmation to the post mentioned against the names of such non-teaching employees are also given below: *Annexure-19.16*

Name	Designation	Date of Confirmation
Mrs. Simerjit Kaur	Medical Attendant	27.08.2015
Mr. Jyoti Singh,	Cook	27.08.2015
Mr. Ranbir Singh	Section Officer	16.09.2015
Mr. Nivedan Salwan	UDC	24.09.2015
Mr. Rohit Rastogi	UDC	24.09.2015

Mrs. Jyoti	LDC	24.09.2015
Mr. Ravinder Singh	Library Attendant	27.09.2015
Mrs. Veerpal Kaur	Library Attendant	30.09.2015
Mr. Harvinder Singh	LDC	01.10.2015
Mr. Darshan Singh	Driver	18.10.2015
Mr. Harvinder Singh	Office Attendant	20.11.2015
Mr. Devi Lal	Office Attendant	20.11.2015
Mr. Pawan Kumar	Office Attendant	25.11.2015
Mrs. Shweta Arora	Deputy Registrar	11.12.2015
Mr. Bhupinder Singh	Professional Asstt.	17.12.2015
Mr. Rajender Kumar	Asstt. Registrar	19.12.2015
Mr. Gautam Sharma	Asstt. Registrar	19.12.2015
Mr. Ravi Dutt	Lab. Attendant	27.12.2015
Mrs. Anupam Sharma	LDC	01.01.2016
Mr. Sachin	LDC	01.01.2016
Mr. Pawan Poonia	Lab. Assistant	02.01.2016
Mr. Sandeep Kumar	Assistant	08.01.2016
Mr. Subhash Chander	MTS	08.01.2016
Mr. Balraj Singh	Driver	08.01.2016
Mr. Roshan Kumar	Lab. Assistant	17.01.2016

RESOLVE

The members, after discussions, unanimously resolved to ratify the confirmation of the following cases where the probation period of 2 years gets completed till 15.12.2015 are to be cleared from the due date as per Annexure-19.16. *Annexure-19.16*

Name	Designation	Date of Confirmation
Mrs. Simerjit Kaur	Medical Attendant	27.08.2015
Mr. Jyoti Singh,	Cook	27.08.2015
Mr. Ranbir Singh	Section Officer	16.09.2015
Mr. Nivedan Jalwan	UDC	24.09.2015
Mr. Rohit Rastogi	UDC	24.09.2015
Mrs. Jyoti	LDC	24.09.2015
Mr. Ravinder Singh	Library Attendant	27.09.2015
Mrs. Veerpal Kaur	Library Attendant	30.09.2015
Mr. Harvinder Singh	LDC	01.10.2015
Mr. Darshan Singh	Driver	18.10.2015
Mr. Harvinder Singh	Office Attendant	20.11.2015
Mr. Devi Lal	Office Attendant	20.11.2015
Mr. Pawan Kumar	Office Attendant	25.11.2015
Mrs. Shweta Arora	Deputy Registrar	11.12.2015

It was further resolved that the other cases, as listed below, where the period of probation was not over, their confirmation cannot be done from a future date on technical grounds. There cases be taken up in the next meeting from their respective due dates.

Name	Designation	Date of Confirmation
Mr. Bhupinder Singh	Professional Asstt.	17.12.2015
Mr. Rajender Kumar	Asstt. Registrar	19.12.2015
Mr. Gautam Sharma	Asstt. Registrar	19.12.2015

Mr. Ravi Dutt	Lab. Attendant	27.12.2015
Mrs. Anupam Sharma	LDC	01.01.2016
Mr. Sachin	LDC	01.01.2016
Mr. Pawan Poonia	Lab. Assistant	02.01.2016
Mr. Sandeep Kumar	Assistant	08.01.2016
Mr. Subhash Chander	MTS	08.01.2016
Mr. Balraj Singh	Driver	08.01.2016
Mr. Roshan Kumar	Lab. Assistant	17.01.2016

Item: EC:19:2015:10

To inform the confirmation of the Teaching Staff who have/are going to complete their probation w.e.f their date of completion of two years.

The Secretary submitted that the probation period for newly appointed faculty members is of two years from the date of joining.

The teaching members who have completed /or are going to complete their period of probations were requested to fill the probation report. Their probation report then was forwarded to the COC of their respective Centres and Deans of their respective Schools for further recommendations on lifting of their probation. A committee was then constituted to recommend on lifting of their probation.

The committee after considering the recommendations of the COC of their respective Centres and Deans of their respective Schools recommended the lifting of the probations of the Teaching Staff members w.e.f the date of completion of their probation period.

He presented the details of such Teaching staff members, which is placed at Annexure-19.17. The details showing the respective date of confirmation to the post mentioned against the names of such teaching staff are also given below: ***Annexure-19.17***

Name	Designation	Date of Confirmation
Dr. Amandeep Singh	Asstt. Prof.	25.03.2015
Dr. Puneeta Pandey	Asstt. Prof.	25.03.2015
Dr. Kiran K. Singh	Asstt. Prof.	25.03.2015
Dr. Bawa Singh	Asstt. Prof.	01.04.2015
Er. Surinder Singh Khurana	Asstt. Prof.	16.04.2015
Dr. Deepak Kumar	Asstt. Prof.	25.04.2015
Dr. Puneet Pathak	Asstt. Prof.	26.04.2015
Dr. Achchhe Lal Sharma	Asstt. Prof.	01.05.2015
Dr. Kamlesh Yadav	Asstt. Prof.	06.05.2015
Dr. Kousik Giri	Asstt. Prof.	10.05.2015
Dr. Preeti Khetarpal	Asstt. Prof.	17.06.2015
Dr. Sandeep Singh	Asstt. Prof.	18.06.2015
Dr. Mahesh Kulharia	Asstt. Prof.	05.07.2015
Dr. Naresh Kumar Singla	Asstt. Prof.	10.09.2015

Dr. Ramanpreet Kaur	Asstt. Prof.	20.09.2015
Dr. Shamshir Singh Dhillon	Asstt. Prof.	28.11.2015
Dr. Monisha Dhiman	Asstt. Prof.	10.12.2015
Dr. Pankaj Bhardwaj	Asstt. Prof.	10.12.2015
Dr. Vikas Jaitak	Asstt. Prof.	10.12.2015
Dr. Nishtha Kaushiki	Asstt. Prof.	23.12.2015
Dr. Anjana Munshi	Associate Prof.	06.01.2016
Dr. Harish Chander	Asstt. Prof.	20.01.2016

RESOLVE

The members, after discussions, unanimously resolved to ratify the confirmation of only the following cases where the probation period of 2 years gets completed till 15.12.2015 are to be cleared from the due date as per Annexure-19.17. *Annexure-19.17*

Name	Designation	Date of Confirmation
Dr. Amandeep Singh	Asstt. Prof.	25.03.2015
Dr. Puneeta Pandey	Asstt. Prof.	25.03.2015
Dr. Kiran K. Singh	Asstt. Prof.	25.03.2015
Dr. Bawa Singh	Asstt. Prof.	01.04.2015
Er. Surinder Singh Khurana	Asstt. Prof.	16.04.2015
Dr. Deepak Kumar	Asstt. Prof.	25.04.2015
Dr. Puneet Pathak	Asstt. Prof.	26.04.2015
Dr. Achchhe Lal Sharma	Asstt. Prof.	01.05.2015
Dr. Kamlesh Yadav	Asstt. Prof.	06.05.2015
Dr. Kousik Giri	Asstt. Prof.	10.05.2015
Dr. Preeti Khetarpal	Asstt. Prof.	17.06.2015
Dr. Sandeep Singh	Asstt. Prof.	18.06.2015
Dr. Mahesh Kulharia	Asstt. Prof.	05.07.2015
Dr. Naresh Kumar Singla	Asstt. Prof.	10.09.2015
Dr. Ramanpreet Kaur	Asstt. Prof.	20.09.2015
Dr. Shamshir Singh Dhillon	Asstt. Prof.	28.11.2015
Dr. Monisha Dhiman	Asstt. Prof.	10.12.2015
Dr. Pankaj Bhardwaj	Asstt. Prof.	10.12.2015
Dr. Vikas Jaitak	Asstt. Prof.	10.12.2015

It was further resolved that the following cases, where the period of probation was not over, their confirmation cannot be done from a future date on technical grounds. There cases be taken up in the next meeting from their respective due dates.

Name	Designation	Date of Confirmation
Dr. Nishtha Kaushiki	Asstt. Prof.	23.12.2015
Dr. Anjana Munshi	Associate Prof.	06.01.2016
Dr. Harish Chander	Asstt. Prof.	20.01.2016

Items from Twelfth Meeting of Finance Committee

Item: EC:19:2015:11

To consider the REVISED progress of Plan Expenditure giving an overview of the financial health of the university, covering major heads of expenditure – buildings, equipment, library, etc.

(Finance Committee in its 12th Meeting vide Item:12:2015:4)

The Secretary apprised the members that, as advised in 11th meeting, the revised progress of Plan expenditure giving an overview of the financial health of the university, covering major heads of expenditure such as buildings, library, equipment, etc. under the budget outlay of the financial year along with investment status, interest earned and statement of fixed deposits are included in the agenda.

While presenting the recommendations of Finance Committee on revised progress of Plan Expenditure,, he brought to the notice that the University has earned Rs. 2,24,94,092/- from Bank Interest, including interest on FDRs for the period from 01.04.2015 to 30.11.2015. Further, he told that Funds amounting to Rs. 25,740.99 lakh were available under XII Plan (including opening balance as on 01.04.2015 Rs. 2,411.70 lakh), from which Rs. 15,976.62 lakh were Expenditure upto 31.10.2015, and Balance amounting to Rs. 9,764.37 lakh are available as on 31.10.2015 (Annexure-19.18). ***Annexure-19.18***

RESOLVE

The Executive Council discussed the recommendations in detail and resolved to approve the revised progress of Plan Expenditure giving an overview of the financial health of the university as recommended under Item:12:2015:4 of FC meeting held on 14th December 2015 as contained in Annexure-19.18. ***Annexure-19.18***

Item: EC:19:2015:12

To consider viable solution for the paucity of space at the City Campus of the university.

(Finance Committee in its 12th Meeting vide Item:12:2015:5)

The Secretary informed the committee that the item was earlier presented before Finance Committee in its 11th meeting vide Item:11:2015:7, wherein FC advised that the Dean Academic Affairs and Registrar will prepare a full-fledged note with justification indicating number of the students/ faculty members expected to join/leave and accordingly requirement of space.

While presenting the resolve of the FC in its 12th meeting held on 14th December 2015 on the recommendations of the Sub Committee of BAC under Item:12:2015:5, he informed that presently 250 boys and 230 girls are residing in respective hostels. In the current session, 140 girls and 153 boys were provided with hostel accommodation. Approximately 47 girls and 54 boys are likely to vacate the hostels by

the end of current session after completing their academic course. Keeping in view the admission trend for the last year as well as likelihood of introduction of some new courses, the additional demand for hostel accommodation is projected at 130 for girls and 130 for boys. The necessary area marked for the construction and the cost estimates were placed under minutes of the Sub Committee of BAC (Annexure-19.19). *Annexure-19.19*

RESOLVE

The Council discussed the recommendations in details and resolved to approve the proceedings of the 21st meeting of Sub Committee of BAC as recommended under Item:12:2015:5 of FC meeting held on 14th December 2015 as contained in Annexure-19.19. *Annexure-19.19*

Item: EC:19:2015:13

To consider the minutes of the 28th meeting of Building Advisory Committee along with the abstract cost of the building projects, in the prescribed format of UGC, held on 3rd December 2015.

(Finance Committee in its 12th Meeting vide Item:12:2015:6)

The Secretary presented the recommendations of the 28th meeting of the Building Advisory Committee held on 3rd December 2015 to consider Preliminary Estimate and Building Plans of Phase I-B; Deposit of balance funds to CPWD for left hand side portion of Main Entrance Corridor and Missing Link portion; and Construction of Hostel Accommodation for the session 2016-17 at City Campus.

The Secretary further presented the comments of Sh. Fazal Mahmood, Deputy Secretary (Finance), MHRD that *no specific comments are made except that the Civil works/ projects should be finalised only after a detailed re-prioritization exercise of the proposed projects has been carried out and only those projects should be approved which are fully funded and are strictly within the sanctioned budget grant of the university for the year 2015-16/XII Plan.*

He brought to the notice of the members the recommendations of the Finance Committee to ratify the recommendations of the 28th meeting of BAC keeping in view the suggestions of the Dy. Secretary Finance.

RESOLVE

The Executive Council, after deliberations, resolved to accept and approve the recommendations of the 28th meeting of BAC as recommended under Item:12:2015:6 of FC

Items from Ninth Meeting of Academic Council

Item: EC:19:2015:14

To consider the Minutes of the Meeting of School Board of the School of Legal Studies and Governance held on 27th August 2015.

(Academic Council in its 9th Meeting vide Item:9:2015:4)

The Secretary informed that First Meeting of School Board of the School of Legal Studies and Governance was held on 27th August 2015 to consider the minutes of Board of Studies of the Centre for Law, wherein all the recommendations of the Board of Studies were approved by the School Board (Annexure-19.20). *Annexure-19.20*

The Academic Council in its 9th meeting vide Item No. AC:9:2015:4, considered and discussed the recommendations of First Meeting of School Board of School of Legal Studies and Governance and resolved to approve and recommend the same to EC.

RESOLVE

Executive Council RESOLVED to ratify the minutes of School Board of School of Legal Studies and Governance as recommended by the AC vide Item:9:2015:4 in its 9th meeting held on 14th December 2015 as contained in Annexure-19.20. *Annexure-19.20*

Item: EC:19:2015:15

To consider the Minutes of the Meeting of School Board of the School of Health Sciences held on 21st September 2015.

(Academic Council in its 9th Meeting vide Item:9:2015:5)

The Secretary stated that a meeting of School Board of the School of Health Sciences was held on 21st September 2015 to consider the minutes of the Board of Studies for Centre for Human Genetics & Molecular Medicine, wherein all the recommendations of the Board of Studies were approved by the School Board Annexed at 19.21. *Annexure-19.21*

The members were further informed that in addition, the School Board (agenda Item No. 6 of Board) proposed establishing a new centre, "Centre for Molecular Diagnostics and Advanced Instrumentation" under the School of Health Sciences. It was proposed that the Centre will start certificate course, diploma course, two master's programmes, one in Advanced Instrumentation and another in Molecular Diagnostics, subject to statutory approvals.

While presenting the recommendations of the AC, he apprised that the Academic Council deliberated on the matter and unanimously approved the minutes of

School Board of the School of Health Sciences, except establishment of new centre.

The AC further approved to refer back the item on new Centre to School Board to consider the name with emphasis on instrumentation. The AC advised that the School Board should prepare a detail proposal keeping in view the value of the courses and budgetary and manpower requirements.

RESOLVE

The Executive Council discussed the matter in detail and resolved to approve the minutes of School Board of the School of Health Sciences, except establishment of new centre, as recommended and suggested under Item:9:2015:5 of Academic Council meeting held on 14th December 2015 as contained in Annexure-19.21. ***Annexure-19.21***

The Executive Council **further Resolved** to refer back the item on new centre to School Board for considering the name with emphasis on instrumentation as well as for preparing a detailed proposal keeping in view the value of the courses and budgetary & manpower requirements.

Keeping in view discussion on the recommendations of the AC under Item:9:2015:5, the Executive Council also **resolved that University needs to develop a Regulation for establishment of a New Centre, wherein all justification, need assessment, target and infrastructural requirements are judiciously placed.**

Item: EC:19:2015:16

To Consider the minutes of the Research Advisory Committee held on 21.11.2015 at IISER, Mohali

The Secretary informed Council that the first meeting of the Research Advisory Committee (RAC) was held on 21st November 2015 at IISER, Mohali. The minutes of RAC are placed as Annexure-19.22. ***Annexure-19.22***

(Academic Council in its 9th Meeting vide Item:9:2015:6)

The Academic Council in its 9th meeting vide Item No. AC:9:2015:6, considered and discussed the recommendations of Research Advisory Committee and resolved to approve and recommend the same to EC.

RESOLVE

Executive Council RESOLVED to ratify the minutes of the Research Advisory Committee as recommended by the AC in its 9th meeting under

Item: EC:19:2015:17

To consider and approve the list of students for award of degrees & Gold Medals and declaration of the result.

(Academic Council in its 9th Meeting vide Item:9:2015:7)

The Secretary informed that in 6th AC meeting, a list of 190 students for the award of degrees and list of 13 students for the award of Gold Medals was approved.

Further, the Academic Council in its 9th meeting vide Item No. AC:9:2015:7, considered the approval for award of degree in addition to 127 students who have fulfilled all requirements for the award of degrees (Annexure-19.23) in the first convocation. ***Annexure-19.23***

The AC discussed the case of 40 students who are likely to complete their degrees but their result is awaited as on today and their list is attached at Annexure-19.24. ***Annexure-19.24***

The AC further, also discussed a list of 10 students, who have qualified for the award of Gold Medals in first convocation, as attached at Annexure-19.25. ***Annexure-19.25***

The members were informed that the gold medals to be awarded is of following specifications:

Inner Part- made of 9 carats gold weighing 15gm with relevant Hallmarked certification.

Outer Part- made with copper having micro-plating.

The Secretary presented the recommendations of the AC that the degrees/gold medals be awarded only to those students whose result has been declared and notified prior to convocation and they have fulfilled all requirements of award of degrees. The students, whose results are declared after convocation, shall be awarded Degrees in next convocation with the year of completion of Degree, in which they completed the programme.

RESOLVE

Executive Council RESOLVED to ratify the recommendations of the Academic Council regarding award of degrees & Gold Medals to eligible students as recommended in 9th Meeting of Academic Council under Item:9:2015:7 as per Annexure-19.23 to 19.25. *Annexure-19.23-19.25*

To consider modification in the Format/Specifications for preparing the dissertation/ thesis by students of CUPB

(Academic Council in its 9th Meeting vide Item:9:2015:8)

The Secretary informed that the format/specifications for preparing the dissertation/thesis by students of CUP was approved on 23.03.2012 by the then Vice Chancellor, and the same is attached at Annexure-19.26. ***Annexure-19.26***

It was further informed that at Page No. 4 of this format it has been prescribed that *after the completion of all the prescribed requirements of programme, the student will submit the two spiral bound copies of the dissertation.* But as per rules and regulations of Ph.D., the thesis shall be examined by three external examiners; one of these shall be from abroad, therefore following modification may be done:

1. After completion of all the prescribed requirements of the Ph.D. programme, the student are required to submit four hard bound copies as per prescribed format.
2. To save paper and environment, the printing should be done on both sides of paper.
3. To make the differentiation of thesis following color codes may be used:

S.N.	Programme	Color Code
1	Ph.D.(Science)	Black with golden letters
2	Ph.D.(Humanities)	Red with golden letters
3	Ph.D.(Commerce)	Navy blue with golden letters
4	M.Phil.(Science)	Brown with silver letters
5	M.Phil.(Humanities)	Royal blue with silver letters
6	M.Pharm.	Olive green with silver letters
7	M.Tech.	Maroon with silver letters
8	LLM	Dark grey with silver letters
9	M.Sc.	Light blue with black letters
10	MA	Beige with black letters
11	M.Ed.	Light yellow with black letters

The Academic Council considered the modification suggested at S.No. 1-3 above in its 9th meeting vide Item:AC:9:2015:8 and after discussion **resolved to recommend to EC to approve these modifications in**

the format/specifications for preparing the dissertation/thesis by students.

RESOLVE

Executive Council RESOLVED to ratify the recommendations of the Academic Council vide Item No. AC:9:2015:8 in its 9th meeting. *Annexure-19.26*

Item: EC:19:2015:19

Any other item

i. To consider the reduction of experience for the post of Driver (LMV).

The Secretary presented the Cadre Recruitment Rules of the University for its Non-Teaching staff, which were forwarded to UGC for its concurrence after due approval of the Executive Council vide Item No. EC:15:15:66.4 and then by circulation on 5th August 2015.

The UGC vide its letter no. F.8-1/2014(CU) dated 05/10/2015 has approved Cadre Recruitment Rules of the University. This was noted by the Executive Council vide Item No.EC:18:2015:28.

He brought to the notice of the members that it has been observed that the experience required for the post of Driver has been mentioned in CRRs as 12 years for LMV and HMV both. The maximum age for applying for the post of Driver in LMV category is 30 years and for HMV it is 40 years. As the minimum age to get the Driving License is 18 years the experience for the post of Driver for LMV is required to be reduced to 6 years instead of 12 years or as is considered justified.

RESOLVE

The Executive Council deliberated on the matter and unanimously resolved to reduce the experience for the post of Driver (LMV) to 5 years instead of 12 years.

ii. To consider the adoption of the Modified Assured Career Progression Scheme

The Secretary brought to the notice of the members that the Sixth Central Pay Commission had recommended Modified Assured Career Progression Scheme (MACPS). The Government had considered the recommendations of the Sixth Central Pay Commission for introduction of a MACPS and has accepted the same with further modification to grant three financial upgradations under the MACPS at interval of 10,20 and 30 years of continuous regular service. (Annexure- 19.27) *Annexure-19.27*

The Chairman added that the CUPB has yet to implement the Modified Assured Career Progression Scheme (MACPS). The University is growing day by day and new non-teaching staff will be joining shortly.

RESOLVE

The Executive Council discussed the rules and regulations of the Govt. of India and resolved to approve the adoption of the Modified Assured Career Progression Scheme (MACPS) by the University as per Annexure-19.27.

Annexure-19.27

iii. To consider authorities for confirmation of Non-Teaching Staff

The Secretary informed that the Cadre Recruitment rules of the University have also been approved by the UGC vide its letter No: F.8-1/2014(CU), dated 05/10/2015.

As per the approved CRR of the University for Group A & Group B positions (Non-Teaching Staff) Executive Council is the Appointing Authority and for Group C positions Vice Chancellor is the appointing Authority.

He proposed that as Vice Chancellor is the appointing Authority for Group C positions their service matters may also be resolved at the level of Vice Chancellor and for all Group A & B positions Executive Council may remain the authority for service matters after following the Rules and regulations prescribed by Government of India.

RESOLVE

While discussion on this item, members unanimously resolved to approve authorization to Vice Chancellor on service matters of Group C employees for confirmation of Non-Teaching Staff as proposed.

iv. To note the joining and resignation of Teaching and Non-Teaching Staff

The Secretary presented before the members the list of Teaching (1 contractual; 2 regular) and Non-Teaching staff (1 regular; 1 contractual) who have resigned from their regular/contractual services is placed at Annexure – 19.28.

Annexure-19.28

The Chairman also informed that Dr. Mridula Mittal has joined her services as Medical Officer with effect from 20th November 2015.

The Executive Council noted and resolved to

RESOLVE approve the resignations as per Annexure-19.28. *Annexure-19.28*

v. **To note the recommendation of the Committee Constituted for Examining the Performance of Mr. Amandeep Singh Mann, System Analyst for Lifting his Probation.**

The Secretary brought to the notice of the members that a Committee was constituted vide Office Order No CUPB/CC/15/OO/205 dated 18.11.2015 to examine the performance during the period of probation of Mr. Amandeep Singh Mann, System Analyst, who is on probation of two years w.e.f. 05.6.2013. The Committee assembled on 9th December 2015 in the Office Chamber of the Dean Academic Affairs and examined the case.

The recommendation of the committee were presented before the Executive Council as per annexure-19.29. *Annexure-19.29*

RESOLVE

After deliberations, the Executive Council resolved to approve the recommendations of the committee as per Annexure-19.29. *Annexure-19.29*

vi. **To ratify the admission of Research Fellows/ Associates working in projects operating at reputed national institutes having MoU with the CUPB to Ph.D degree programmes at CUPB.**

The Central University of Punjab has MoU with some reputed National Laboratories/ Institutes/ Centres.

One such organization i.e. Centre of Innovative and Applied Bioprocessing (CIAB), Mohali has requested to allow its Research Fellows to register for Ph.D. degree at CUPB. The following guidelines are submitted for consideration and approval of the Academic Council for this and other similar cases:

1. The concerned organization should be a reputed National Laboratory/ Institute/ Centre with adequate facilities for Ph.D. research as verified by a committee constituted by the Vice Chancellor CUPB. If need be, the committee shall seek information from the organization and take a decision and/ or shall make a visit, if necessary.

2. The organization should have a MoU with CUPB specifically to the effect that CUPB recognizes and accredits the scientists/ faculty of the organization for guiding research leading to Ph.D. The scientist/ faculty at the level of Assistant Professor or above shall be eligible for such accreditation and will be termed as "eligible guides" for Ph.D. degree.

3. The candidate intending to register at CUPB shall meet the eligibility criteria for Ph.D. admission as laid out at CUPB. This may include the required percentage of marks at various levels, requirement of NET and any other requirements laid by UGC.

4. The student shall choose his/ her guide at the concerned organization and route the application with specific recommendation of the Head of the organization certifying that the student is working as a Research Fellow/ Research Associate or equivalent position.

5. The student may be allowed to begin the Ph.D. programme during odd/ even semester by Vice- Chancellor CUPB, as per CUPB regulations.

6. The student once admitted shall register at CUPB each semester and shall pay the fees as prescribed by CUPB for its Ph.D. students.

7. The student shall have to carry out the course work for one semester at CUPB as required by UGC regulations. He/ she shall attempt to complete all the required course work. For some selected specialized courses, the Vice Chancellor CUPB may permit the student to carry out classes at his own organization. In such cases, the head of the organization shall issue a certificate to the effect that the Faculty for teaching the course is available and schedule of classes will be submitted to CUPB. However, the examination shall be conducted at CUPB.

8. The student shall deliver synopsis seminar, pre-submission and thesis submission seminars at CUPB.

9. In all publications from Ph.D. thesis work, the student shall mention CUPB in the address as his/ her co-affiliate institution, while the guide may mention the address of his/ her organization. For the research work carried out by the student/ scholar at CUPB, partly or fully, and included in patents or other

intellectual properties, CUPB will be given due credit also.

10. All other Ph.D. regulations as applicable to CUPB students shall apply.

RESOLVE

The Executive Council considered and **resolved to approve the guidelines for admission of Research Fellows/ Associates working in projects operating at reputed national institutes having MoU with the CUPB to Ph.D degree programmes at CUPB as recommended by the Academic Council in its 9th meeting under Item:9:2015:9.i**

vii. To consider the Minutes of the Meeting of School Board of the School of Social Sciences held on 12th December 2015.

The Secretary informed that a meeting of School Board of the School of Social Sciences was held on 12th December 2015 to discuss on the finalization of course code, course structure and syllabus content of various courses of different programmes/M.A. & Ph.D. programmes of Centre for Sociology and Ph.D. in Economics of Centre for Economics.

RESOLVE

The Executive Council considered the Minutes of the School Board for School of Social Sciences and **unanimously resolved to approve the same as recommended the Academic Council in its 9th meeting under Item:9:2015:9.ii.**

viii. To note the concurrence though email of members who could not attend the 19th meeting of the Executive Council.

The Chairman informed the members that the following members who due to their preoccupations could not attend the meeting have sent their concurrence on the agenda items by email:

i. Prof. R.C. Sobti
ii. Prof. A.D.N. Bajpai

The Chairman apprised the Council on the difficulties in reaching Bathinda, which is poorly connected and most of the members finding it difficult to spare greater time for attending meetings, though they are very much willing to share their experiences for betterment of university.

The concurrence of two members is an evidence to the zeal of members. He further added that ICTs can ease the matter of physical attendance using technologies of video conferencing. The comments if received through email may be recorded as presence

of members in absentia. This will enable the EC for smooth decision making process.

RESOLVE

The Executive Council appreciated the proposal and **resolved to promote ICT enabled EC meetings through video conferencing.**

It was further resolved that concurrence through emails be accounted for statutory obligations of quorum and honorarium as per rule be paid.

It was also resolved to approve sitting fee to such members, who contribute through Skype, be sent to them in future.

ix. To consider that

a) **The university reserves the right to relax any of the qualifications, experience, age etc, in exceptionally deserving cases of all posts on the recommendations of the Screening and Selection Committee.**

b) **Condonation of age of persons working at Central University of Punjab may be limited to the period proportionate to the period of service rendered at the university or up to a maximum of 5 years whichever is less.**

The Secretary stated that a committee constituted by the Vice Chancellor under Chairmanship of Dean Academic Affairs, referred to the approved Cadre recruitment rules of the university and discussed on the following issues:

1. Under clause 2(f) of CRRs "Non-Teaching Employees" means employees of the University other than University teachers and such other employees as defined otherwise.
2. As per clause 26 of CRRs **Power to relax:** Employees of Central University of Punjab, Bathinda shall be given age relaxation as per Govt. of India rules. As per GOI rules (Annexure-19.30) an applicant who has rendered minimum 3 years continuous service shall be given a relaxation of 5 years. *Annexure-19.30*
3. As per clause 31 of CRRs, The Executive Council shall have the authority to amend, modify change, withdraw, suspend and relax any or all of these rules. The decisions of the Executive Council shall be final and binding on all employees.

The members were further informed that, after going through the CRRs the committee decided to consult the CRRs of other Central Universities or Institutes of National importance by downloading the same from the websites.

The committee after downloading the

CRRs/Recruitment Advertisements of 7 Central Universities and IIT deliberated on the same as detailed below:

Sr. No.	Name of University/Deptt.	Age relaxations
1.	Central University of Rajasthan	Age limit shall not apply to the employees of the CU Raj. Condonation of age of contract/daily wage workers limited to period proportionate to the period of service rendered at university.
2.	Central University of Haryana	Relaxation of qualification experience age etc in exceptionally deserving cases of all posts on the recommendations of the screening and selection committee
3.	Central University of Himachal Pradesh	The Vice Chancellor shall have the right to relax any of the qualifications, experience, age etc. in exceptionally deserving cases of all posts.
4.	Central University of Jammu	Relaxation of qualification experience age etc in exceptionally deserving cases of all posts on the recommendations of the screening and selection committee
5.	Central University of Gujarat	The age prescribed for direct recruitment shall not be applicable to those candidates from within the university
6.	Central University of Karnataka	Relaxation of qualification experience age etc in exceptionally deserving cases of all posts on the recommendations of the screening and selection

		committee
7.	Central University of Kashmir	Relaxation of qualification experience age etc in exceptionally deserving cases of all posts on the recommendations of the screening and selection committee
8.	Indian Institute of Technology Delhi	The age relaxation upto maximum of five years can be given to the candidates who appear to have special qualifications or highly relevant experience for the concerned position

The committee also deliberated on the judgement of Hon'ble High Court given in the case filed by Mr. Gopal Singh Soni against the university (Annexure-19.31) *Annexure-19.31*

After deliberations on the above documents including Hon'ble High Court's Judgement the committee recommended that in order to have parity with the other Central Universities and also to avoid any future litigations against the University, the following clauses may be added in the CRRs of the university:-

1. The university reserves the right to relax any of the qualifications, experience, age etc, in exceptionally deserving cases of all posts on the recommendations of the Screening and Selection Committee.

2. Condonation of age of persons working at Central University of Punjab may be limited to the period proportionate to the period of service rendered at the university or up to a maximum of 5 years whichever is less.

RESOLVE

The Executive Council discussed at length the recommendations of the committee and the justification provided and as per the Clause 26 and 31 of CRRs and powers vested in it resolved to approve the recommendations of the committee as under:

a) The university reserves the right to relax any of the qualifications experience, age etc. in exceptional deserving cases of any post on the recommendations of the Screening and Selection Committee.

b) Condonation of age of employees working at Central University of Punjab equivalent to the period of service rendered at the university (CUPB) upto a maximum of 5 years.

Item:EC:19:2015:20

Fixing date of the next meeting of the Executive Council.	Executive Council authorized Chairman to fix the date for the next meeting as per need.

Registrar (Secretary)

Proceedings Approved

20/1/16

Prof. R. K. Kohli
Vice Chancellor & Chairman Executive Council

ACTIONS TAKEN ON 18th EXECUTIVE COUNCIL DECISIONS

Item No.	Decision in Brief	Action Taken
Item:18:2015:1 To confirm the minutes of the Seventeenth Meeting of Executive Council held on 7th September 2015.	Executive Council with due deliberations, resolved unanimously to confirm the minutes of its Seventeenth Meeting.	Noted/Approved
Item:18:2015:2 To consider the Action Taken Report on the decisions of Seventeenth Meeting of Executive Council held on 7th September 2015	EC noted the ATR and expressed satisfaction.	Noted/Approved
Item:18:2015:3 To present Report of the Vice Chancellor on the progress of the University.	Executive Council after discussions unanimously resolved to accept the report and appreciate the progress of the University.	Noted/Approved
Item:18:2015:4 To consider and recommend the Annual Report of the University for the academic year 2014-15, for onward submission to University Court.	The Executive Council considered and RESOLVED to recommend the same for consideration of University Court in its third meeting scheduled on 7th November 2015.	Implemented. Annual Report 2014-15 was placed before Court in its 3rd meeting and after approval got printed and requisite copies delivered to MHRD on 24.11.2015 by hand.
Item:18:2015:5 To consider the progress of Plan Expenditure giving an overview of the financial health of the university, covering major heads of expenditure – buildings, equipments, library, etc	The Executive Council resolved to approve the recommendations of the Finance Committee on Plan Expenditure. The Chairman advised the Accounts Officer to comply with the suggestions of the members and present in future the outlay of the financial year.	Suggestions complied with. Placed in 12th meeting of Finance Committee
Item:18:2015:6 To consider and recommend the Annual Financial Report and Audit Report on the annual accounts of the University for the financial year 2014-15, for onward submission to the University Court.	The Executive Council ratified the recommendations of the Finance Committee regarding approval of the Annual Financial Report and Audit Report for the financial year 2014-15.	Implemented. Annual Financial Report and Audit Report for the financial year2014-15 were placed before Court in its 3rd meeting and after approval got printed and requisite copies delivered to MHRD on 24.11.2015 by hand.
Item:18:2015:7 To consider the appointment of Medical Officers.	The EC considered and resolved to approve the recommendations of the Selection Committee and approved the appointments of the following candidates, subject to re-verification of laid down eligibility to the above mentioned posts as per rules and	Implemented. Appointment letters have been issued. Dr. Mridula Mittal joined on 20th November 2015.

	prescribed probation in the pay scale of 15600-39100, AGP Rs. 5400/-: 1. Dr. Mridula Mittal 2. Dr. Ajaybir Singh Sekhon	
Item:18:2015:8 To consider the appointment in Centre for Mathematics and Statistics of a) Associate Professors b) Assistant Professors	The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments/to keep waitlisted the following candidates, subject to re-verification of laid down eligibility to the above mentioned posts as per rules and prescribed probation: a) Associate Professor in the pay scale of Rs. 37400-67000, AGP Rs. 9000/- i. Dr. Rajesh Kumar Gupta ii. Dr. Gauree Shanker b) Assistant Professor in the pay scale of Rs. 15600-39100, AGP Rs. 6000/- i. Dr. Mahaveer Singh Panwar Waitlisted* i. Dr. Joginder Kumar * To be offered appointment in case the selected candidate does not join in a specified time period without a valid reason.	Implemented. Appointment letters have been issued
Item:18:2015:9 To consider the appointment of Associate Professors in Centre for Chemical Sciences.	The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments/to keep waitlisted the following candidates, subject to re-verification of laid down eligibility to the above mentioned posts as per rules and prescribed probation in the pay scale of 37400-67000, AGP Rs. 9000/-: 1. Dr. Rajesh Kumar Waitlisted* 2. Dr. Ravindra Kumar Rawal * To be offered appointment in case the selected candidate does not join in a specified time period without a valid reason. The EC further resolved that the post of Associate Professor in the Centre for Chemical Sciences reserved for SC candidate be re-advertised in view of fewer applications.	Implemented. Appointment letters have been issued
Item:18:2015:10 To consider the appointment of Assistant Professors in Centre for Sociology.	The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments/to keep waitlisted the following candidates, subject to re-verification of laid down eligibility to the above mentioned posts as per rules and	Implemented. Appointment letters have been issued

	prescribed probation in the pay scale of Rs. 15600-39100, AGP Rs. 6000/-: 1. Dr. Sumedha Dutta (Gen) Waitlisted:* 2. Dr. Saroj Kumar Dhal * To be offered appointment in case the selected candidate does not join in a specified time period without a valid reason. The Selection Committee did not find any candidate suitable for the post reserved for SC category. Accepting the recommendations of the Selection Committee, the EC further resolved that the post be re-advertised.	
Item:18:2015:11 To consider the appointment of Associate Professors in Centre for Physical Sciences.	The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments/to keep waitlisted the following candidates, subject to re-verification of laid down eligibility to the above mentioned posts as per rules and prescribed probation in the pay scale of 37400-67000, AGP Rs. 9000/-: 1. Dr. Rupesh Shivaji Devan (subject to production of evidence of passing PhD before 31 August 2007) 2. Dr. Santosh Kumar Mahapatra Waitlisted* 1. Dr. Santosh Kumar Tripathi * To be offered appointment in case the selected candidate does not join in a specified time period without a valid reason.	Implemented. Appointment letters have been issued
Item:18:2015:12 To consider the appointment of Associate Professors in Centre for Pharmaceutical Sciences and Natural Products.	The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments the following candidate, subject to re-verification of laid down eligibility to the above mentioned posts as per rules and prescribed probation in the pay scale of 37400-67000, AGP Rs. 9000/-: 1. Dr. Raj Kumar (Gen) The Selection Committee did not find any candidate suitable for the post reserved for SC category. Accepting the recommendations of the Selection Committee, the EC further resolved that the post be re-advertised.	Implemented. Appointment letter have been issued
Item:18:2015:13 To consider the appointment of Associate Professors in Centre for Plant Sciences.	The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments the following candidate, subject to re-verification of laid down	Implemented. Appointment letter is being issued

	eligibility to the above mentioned posts as per rules and prescribed probation in the pay scale of 37400-67000, AGP Rs. 9000/-: 1. Dr. Sanjeev Kumar	
Item:18:2015:14 To consider the appointment of Associate Professors in Centre for Animal Sciences.	The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments the following candidates, subject to re-verification of laid down eligibility to the above mentioned posts as per rules and prescribed probation in the pay scale of 37400-67000, AGP Rs. 9000/-: 1. Dr. Anil Kumar Mantha 2. Dr. Aklank Jain	Implemented. Appointment letters are being issued
Item:18:2015:15 To consider the appointment of Associate Professors in Centre for Geography and Geology.	The Selection Committee did not find any candidate suitable for both the posts. Accepting the recommendations of the Selection Committee, the EC resolved that the post be re-advertised.	Implemented. Appointment letters have been issued
Item:18:2015:16 To consider the appointment in Centre for Environmental Science & Technology of a) Professor b) Associate Professors	The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments/to keep waitlisted the following candidates, subject to re-verification of laid down eligibility to the above mentioned posts as per rules and prescribed probation: a) Professor in the pay scale of Rs. 37400-67000, AGP Rs. 10000/- 1. Dr. Vinod Kumar Garg Waitlisted* 2. Dr. Shivesh Sharma * To be offered appointment in case the selected candidate does not join in a specified time period without a valid reason. b) Associate Professor in the pay scale of Rs. 37400-67000, AGP Rs. 9000/- The Selection Committee did not find any candidate suitable for the post. Accepting the recommendations of the Selection Committee, the EC further resolved that the post of Associate Professor be re-advertised.	Implemented. Appointment letters have been issued
Item:18:2015:17 To consider the appointment of Assistant Professor in Centre for Computer Science & Technology.	The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments/to keep waitlisted the following candidates, subject to re-verification of laid down eligibility to the above mentioned posts as per rules and prescribed probation in the pay scale of	Implemented. Appointment letters have been issued

	15600-39100, AGP Rs. 6000/-: 1. Dr. Satwinder Singh (Gen) 2. Dr. Rakesh Kumar (OBC) Waitlisted* 3. Dr. Navjyot Sidhu * To be offered appointment in case the selected candidate does not join in a specified time period without a valid reason.	
Item:18:2015:18 To consider the appointment in Centre for Computational Sciences of a) Professor b) Assistant Professors	The sealed recommendations of the Selection Committee, for both interviews, were opened and circulated among the members for perusal. a) Professor in the pay scale of Rs. 37400-67000, AGP Rs. 10000/- The Committee found NONE SUITABLE for the position of Professor, however suggested to appoint young Assistant Professor against the position. The Executive Council resolved to accept the suggestion of the Selection Committee. b) The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments/to keep waitlisted the following candidates, subject to re-verification of laid down eligibility to the post of Assistant Professor in the pay scale of Rs. 15600-39100, AGP Rs. 6000/- as per rules and prescribed probation: 1. Dr. Vijay Kumar Yogesh Muley (SC) The EC further resolved that the post of Associate Professor in the Centre for Chemical Sciences reserved for ST candidate be re-advertised , in view of fewer applications.	Implemented. Appointment letters have been issued
Item:18:2015:19 To consider the appointment of Assistant Professor in Centre for Classical and Modern Languages	The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments the following candidate, subject to re-verification of laid down eligibility to the above mentioned posts as per rules and prescribed probation in the pay scale of 15600-39100, AGP Rs. 6000/-: 1. Dr. Shahela Zafar (Gen) (English) The Selection Committee did not find any candidate suitable for the post reserved for Punjabi (SC category). Accepting the	Implemented. Appointment letters have been issued

	recommendations of the Selection Committee, the EC further resolved that the post be re-advertised.	
Item:18:2015:20 To consider the appointment in Centre for Bio-chemistry and Microbial Sciences of a) Professor b) Associate Professors c) Assistant Professors	The EC considered and resolved to approve the recommendations of the Selection Committee and approved to make offer of appointments/to keep waitlisted the following candidates, subject to re-verification of laid down eligibility to the above mentioned posts as per rules and prescribed probation: a) Professor in the pay scale of Rs. 37400-67000, AGP Rs. 10000/- i. Dr. Ramakrishana Wusirika b) Associate Professor in the pay scale of Rs. 37400-67000, AGP Rs. 9000/- i. Dr. Monisha Dhiman ii. Dr. Malkey Verma Waitlisted:* iii. Dr. Aklank Jain iv. Dr. Gunajn Goel * To be offered appointment in case the selected candidate does not join in a specified time period without a valid reason. c) Assistant Professor in the pay scale of Rs. 15600-39100, AGP Rs. 6000/- i. Dr. Somesh Baranwal (Gen) ii. Dr. Pramod Kumar Kushawaha (OBC) Waitlisted (General Category)* iii. Dr. Shashank Gupta iv. Dr. Gunjan Goel * To be offered appointment in case the selected candidate does not join in a specified time period without a valid reason.	Implemented. Appointment letters have been issued
Item:18:2015:21 To consider the minutes of the 27th meeting of BAC along with the abstract cost of the building projects, in the format of UGC, held on 26th October 2015.	Executive Council RESOLVED to ratify the minutes of 27th BAC along with abstract cost of the building projects as recommended by the FC.	Implemented
Item:18:2015:22 To consider a viable solution for the paucity of space at the City Campus of the university.	Executive Council noted the proceedings of Finance Committee.	--

Item:18:2015:23 To consider Chief Guest for the First Convocation of university.	Executive Council resolved that Chief Justice, Punjab and Haryana High Court or the Chancellor of the University who is himself an acclaimed scientist decorated with Padam Bhushan award of the Government of India to be invited as Chief Guest for its First Convocation to be held in the year 2015 as the degrees have already been printed. It was also suggested that nominations may also be obtained from the University Court.	First Convocation schooled on 15th December 2015 with well-acclaimed academician Padma Bhushan Professor S.S. Johl, Chancellor of the Central University of Punjab as Chief Guest. He will also deliver the Convocation Address.
Item:18:2015:24 To consider the appointment of non-teaching staff on short term and contractual basis for 89 days.	The Executive Council Resolved to ratify the recommendations of the committee and approve hiring of 29 non-teaching staff on short term and contractual basis for 89 days or till appointment on regular basis is made, whichever is earlier	Appointment letters issued
Item:18:2015:25 To consider the appointment of Superintendent of Hostels, on contractual basis.	The Executive Council Resolved to ratify the appointment of Superintendent of Hostels, on contractual basis till completion of current semester at fixed emoluments of Rs. 36,000/- per month.	Noted
Item:18:2015:26 To note the overall progress of plan expenditure and building projects.	The Executive Council noted the overall progress of the plan expenditure and the status of building projects, as recommended by the FC.	Noted /Approved
Item:18:2015:27 To note the submission of NAAC SSR by the university.	The Executive Council appreciated and noted the NAAC Self-Study Report.	Noted
Item:18:2015:28 To note the approval of the Cadre Recruitment Rules (Non –Teaching Employees), 2015 by UGC subject to minor modifications.	The Executive Council resolved to approve the Cadre Recruitment Rules (Non-Teaching Employees), 2015 by UGC with modifications, as per Annexure 18.13.	Noted. Advertisement for non-teaching positions issued on 3rd November 2015.
Item:18:2015:29 To note the writ petition CWP No. 20364 of 2015 titled Gopal Singh Soni Vs. State of Punjab and Others with Central University of Punjab as part to the case at S.No. 3.	The Executive Council noted the writ petition CWP No. 20364 of 2015 titled Gopal Singh Soni Vs. State of Punjab and Others with Central University of Punjab.	Noted
Item:18:2015:30	**Add On Agenda**	
i. To consider the appointment in Centre for Comparative Literature of a) Associate Professors b) Assistant Professor	a) While considering the recommendations of the Selection Committee held on 24th October 2015, for Associate Professors (GEN) in Centre for Comparative Literature, the Executive Council noted discrepancies in the experience required for the position in one of the recommended candidate. EC desired to verify the eligibility conditions of both the recommended candidates on count of educational qualifications, experience	Placed in the current meeting of the Executive Council at Item No. EC:19:2015:4

	and API scores and the findings shall be placed in the next EC meeting. b) The Selection Committee did not find any candidate suitable for the post of Assistant Professor. Accepting the recommendations of the Selection Committee, the EC further resolved that the post be re-advertised.	
ii. To consider appointment of attendants for Hostels and Library through service provider	Executive Council considered the appointment of attendants for hostels and library through service provider and Resolved to approve the same. The EC also advised that University may find a permanent solution to this problem by getting sanctioned new positions as hostels and library are the permanent features of university and the students will increase in number with each academic session.	Under Implementation
Item:18:2015:31 Fixing date of the next meeting of the Executive Council.	Executive Council authorized Chairman to fix-up dates for the next meeting as per need.	19th EC meeting scheduled on 14th December 2015

Progress Report
(Period: from 1.11.2015 to 14.12.2015)

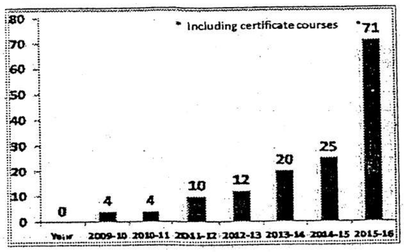
Executive Council Meeting
December 15, 2015

Warm Welcome to the Members

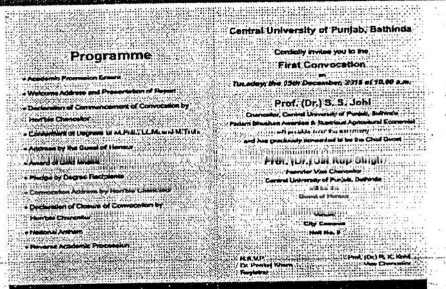
CENTRAL UNIVERSITY OF PUNJAB

at Central University of Punjab, Bathinda

No. of Courses offered



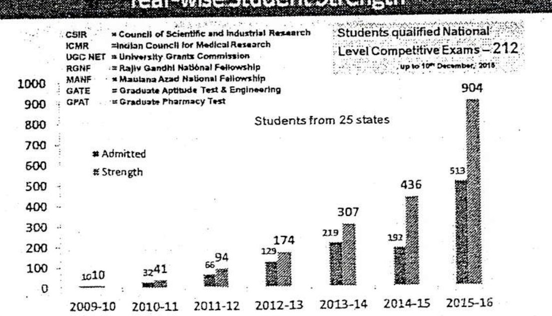
First Convocation
15th December 2015



First Convocation - 2015
Students Eligible for Degree as on dated 15.12.2015

Degree	Class Name	Male	Female	Class wise Detail	Total No. of Students
Master of Arts	Punjabi (Hons.)	2	2	4	4
Master of Laws	Environmental Law	12	4	16	16
Master of Pharmacy	Pharmaceuticals Sciences (MC)	14	12	26	26
Master of Philosophy	Biosciences	23	12	35	191
	Comparative Literature	19	28	47	
	Development Economics	17	18	35	
	Environmental Science and Technology	11	18	29	
	Physics	6	3	9	
	South and Central Asian Studies	[illegible]	[illegible]	[illegible]	
Master of Science	Biosciences	4	17	21	48
	Chemical Sciences (MC)	0	9	9	
	Molecular Genetics	0	1	1	
	Environmental Science and Technology	1	9	10	
	Physics	6	1	7	
Master of Technology	Computer Science and Technology	14	18	32	43
	Cyber Security	6	5	11	
TOTAL		**161**	**167**	**328**	**328**

Year-wise Student Strength



Status of Building Projects *(as per UGC proforma)*

Sl. No.	Name of the building	Source of funding	Allocation made by UGC (Rs. in lakhs)	Plan Estimates approved by Building Committee (Rs. lakhs)	Date of starting of construction	Expected date of completion	Progress made so far	Name of the construction agency	Remarks, if any
1	2	3	4	5	6	7	8	9	10
	Development of main campus Phase 1A	UGC	Rs. 135,00 Lacs	Rs. 13,500 lacs 135 crore	3.9.2015 (Foundation stone laid on 7-Sept, 2015)	4.1.2017	10%	KSM Bashir Mohammad & Sons	
	Phase 1B		7,800 78 crore	Rs. 9,700 lacs 97 crore			(approved by BAC against available sanction)		
	Pending works			130.72	(sanction awaited)				
	Total Cr		213.00	362.72	Deficient: 149.72 crore				

New Building projects to be started during XII plan

Name of the Building Project: Development of Main Campus at Ghudda (Phase 1B)

ABSTRACT OF COST

Total built up area provided in the Plans: 66428 Sqm — **Cost per sq. meter Rs. 33,532/-**

S.No	Item	Amount (Rs. Lac)
1	Cost of Civil Works	Rs 125,73,21,485
2	Internal Water Supply & Sanitation (as prescribed Annexure IV (B) of Guidelines	Rs 258,145,570
3	Internal Electrification (as prescribed in Annexure IV (B) of Guidelines)	Rs 374,811,168
4	External Services @5% of civil Cost	Rs 70,272,988
5	Total Amount	Rs 1,960,551,211
6	Contingences @ 3% of 5	Rs 58,816,536
7	Architect Fees	Rs 82,709,190
	Misc. works e.g. CCTV, Power Backup	Rs 28,615,650
8	Clerk of Works, if appointed	Rs 1,45,00 Lac
9	Service tax	Rs 120,759,128
10	Total Estimated Cost	Rs. 222,72.00

S.NO	Details of project under Implementation	Phase 1 (A)
	BUILDING	TOTAL BUILT UP AREA (SQ.M)
A1	Staff Housing Type - A	223
A2	VIP Guest House	1805
A3	Student Dining	1219
A4	Staff Housing Type - B	852
A5	PG Hostel Men	20071.5
A6	PG Hostel Women	20715
A7	Staff Housing Type - C	9790
A8	Academic Block	30413
A9	Water Centre & Utility Block	920
	TOTAL (Cost 135 Cr)	63366
		Phase 1 (B)
B1	VC's Residence	1028
B2	Transit Hostel	3456
B3	UG Hostel Men	13295
B4	UG Hostel Women	13295
B5	Site Development	(minimum area)
B6	VC's Office (subject to fund)	9231
	Total (Cost (Rs 92 Cr)	34305
B7	Staff Housing Type-D	17280
B8	Admin Block on Building	12228
B9	Library	49093
B10	Site Development	
TOTAL		

Cost of Phase 1 (A) Rs. 135.00 Cr.

Cost of Phase 1 (B) Rs. 227.72 Cr.

Total Cost Ph. 1 (A) & (B) Rs. 362.72 Cr

Filling up the vacancies

Names of the Visitor's Nominees received on 4.9.2015

Updated till 10.12.2015

a. Status as per sanctioned positions

Total sanctioned Teaching Positions		Total Positions Filled	Regular	Contractual	Vacant
Professor	21	09		09	12
Associate Professor	42	21		01	21
Assistant Professor	84	73		02	11
Total	147	103		12	44

b. Status of working Centres

Total sanctioned Teaching Positions in working Centres		Total Positions Filled	Regular	Contractual	Vacant
Professor	19	09		09	10
Associate Professor	38	21		01	17
Assistant Professor	76	73		02	03
Total	133	103		12	30

No. of Faculty Members

Faculty from 15 States

- Conducted interviews for all the vacant posts in 14 Centres
- Yet to join: 23
- Will make faculty of 95

Regular / Total

DST INSPIRE Faculty
Ramalingamswamy Fellow
Ramanujan Fellow

2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
1	1	12	16	40	40	70
10	20	27	41	57	52	80

No. of Non-teaching Staff

Staff from 9 States

* Including 4 on deputation

Yet to join: 1 Medical Officer

Regular / Total

2009-10	2010-11	2011-12	2012-13	2013-14	2014-15	2015-16
0	3	4	6	33	32	33
6	22	28	35	63	59	67

Research Projects

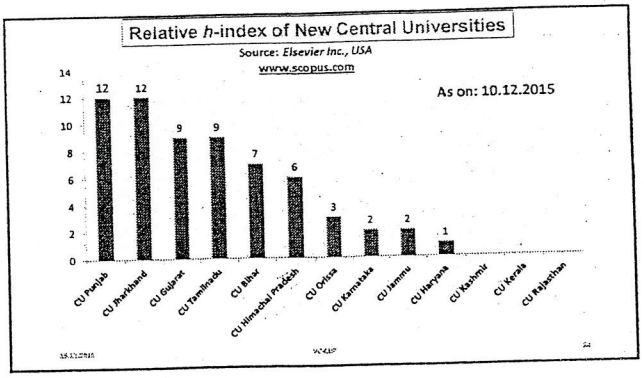
Total 84 projects worth Rs. 13.76 crores

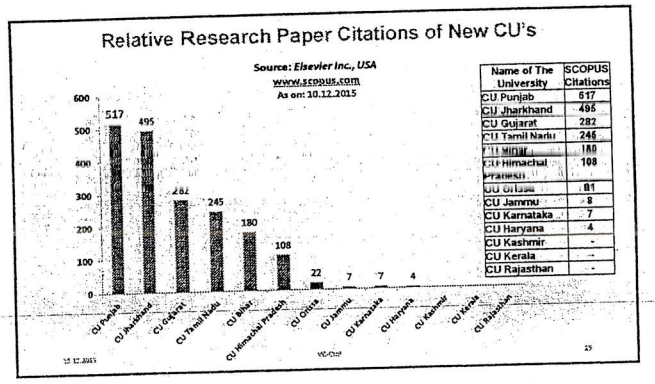
Sanction of a few more is in pipeline

Funding Agencies	DUPR	UGC	DST	DBT	ICSSR	MoES	MoST	BRNS	ICMR	CSIR	AIZH
Number of Projects	24	73	13	4	6	1	1	2	2	1	1
Total Grant (Lacs)	63.28	366.03	676.15	135.70	30.35	10	82	44.51	65.7	20	58

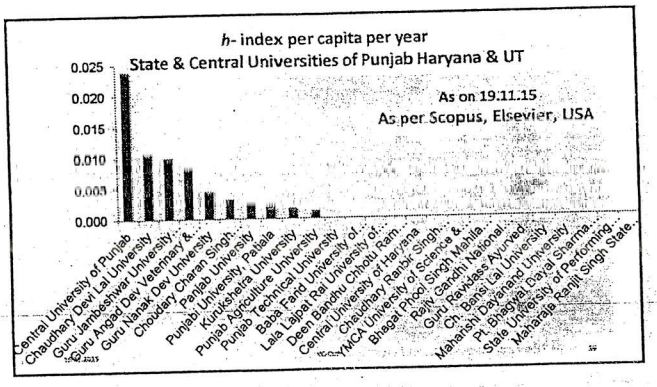
Introduced Online Examination for End-semester exams

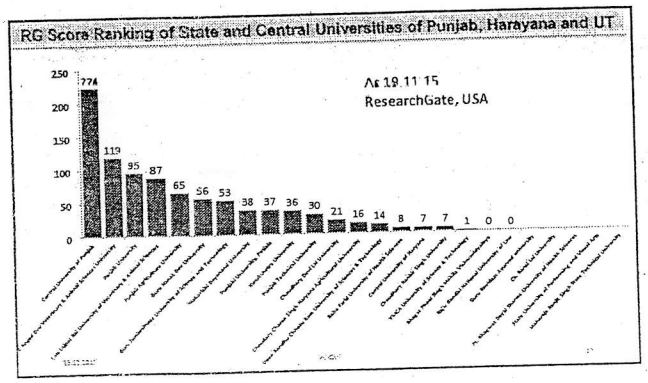
- Central University of Punjab has become the first university in country to start end-semester examination in the Online mode.
- 500 questions submitted by each teacher for each course; final selection by random choice.
- Total of 160 question papers have been set.
- For each paper 3 difficulty levels; regular updation of question banks.
- After exams, students can see the analysis of question paper online.

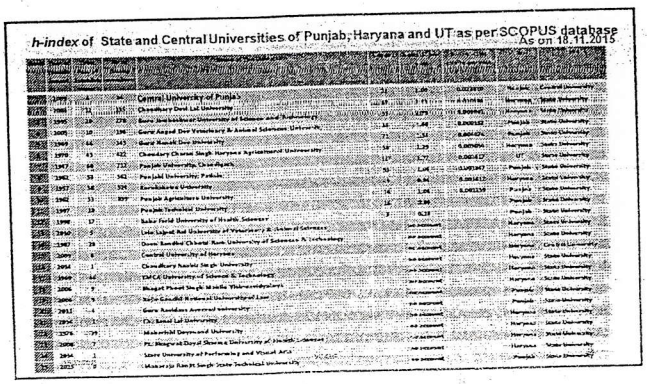




Name of The University	SCOPUS Citations
CU Punjab	517
CU Jharkhand	495
CU Gujarat	282
CU Tamil Nadu	246
CU Bihar	180
CU Himachal Pradesh	108
CU Orissa	81
CU Jammu	8
CU Karnataka	7
CU Haryana	4
CU Kashmir	-
CU Kerala	-
CU Rajasthan	-







Relative Ranking Impact Points of New CUs in India and Regional Universities as per Research Gate, USA

Rank	Institutions Ranking in India	Name of the University	Total Impact Pts.
1	273	Central University of Punjab	382.27
2	608	Central University of Bihar	101.94
3	741	Central University of Kashmir	73.65
4	1347	Central University of Rajasthan	22.07
5	1504	Central University of Gujarat	16.85
6	1511	Central University of Tamil Nadu	16.47
7	2030	Central University of Jharkhand	7.73
8	2150	Central University of Himachal Pradesh	5.18
9	2620	Central University of Kerala	1.09
10	2808	Central University of Karnataka	2
11		Central University of Haryana	
12		Central University of Jammu	
13		Central University of Orissa	

Rank	Year of Establishment	[illegible]	Institution Ranking in India	Name of the University	[illegible]	[illegible]	[illegible]	State
[illegible]	2009	84	277	Central University of Punjab	400.50	[illegible]	[illegible]	Punjab
[illegible]	1969	[illegible]	87	Guru Nanak Dev University	[illegible]	[illegible]	[illegible]	Punjab
[illegible]	1947	[illegible]	[illegible]	Panjab University, Chandigarh	[illegible]	[illegible]	[illegible]	UT
[illegible]	1995	[illegible]	276	GJ University of Science and Technology	[illegible]	[illegible]	[illegible]	Haryana
[illegible]	1970	[illegible]	90	C.C.S Haryana Agricultural University	[illegible]	[illegible]	[illegible]	Haryana
[illegible]	1962	[illegible]	71	Punjabi University, Patiala	[illegible]	[illegible]	[illegible]	Punjab
[illegible]	2005	[illegible]	487	Guru Angad Dev Veterinary & Animal Sci. Univ.	[illegible]	[illegible]	[illegible]	Punjab
[illegible]	1962	[illegible]	66	Punjab Agriculture University	[illegible]	[illegible]	[illegible]	Punjab
[illegible]	1957	[illegible]	116	Kurukshetra University	[illegible]	[illegible]	[illegible]	Haryana
[illegible]	1976	[illegible]	171	Maharshi Dayanand University	[illegible]	[illegible]	[illegible]	Haryana
[illegible]	2003	[illegible]	753	Chaudhary Devi Lal University	[illegible]	[illegible]	[illegible]	Haryana
[illegible]	1987	[illegible]	[illegible]	Deen Bandhu Chhotu Ram Univ of Sci & Tech.	[illegible]	[illegible]	[illegible]	Haryana
[illegible]	2010	[illegible]	[illegible]	Lala Lajpat Rai Univ of Veterinary & Animal Sci.	[illegible]	[illegible]	[illegible]	Haryana
[illegible]	1969	[illegible]	[illegible]	YMCA University of Science & Technology	[illegible]	[illegible]	[illegible]	Haryana
[illegible]	1997	[illegible]	255	Punjab Technical University	[illegible]	[illegible]	[illegible]	Punjab
[illegible]	1998			Baba Farid University of Health Sciences				Punjab
[illegible]	2009			Central University of Haryana				Haryana
[illegible]	2014			Chaudhary Ranbir Singh University				Haryana
[illegible]	2006			Bhagat Phool Singh Mahila Vishwavidyalaya				Haryana
[illegible]	2006			Rajiv Gandhi National University of Law				Punjab
[illegible]	2011			Guru Ravidass Ayurved University				Punjab
[illegible]	2014			Ch. Bansi Lal University				Haryana
[illegible]	2008			Pt. B.D. Sharma University of Health Sciences				Haryana

Impact Points are calculated based on the journal where research has been published.

15.12.2015

RG Score Ranking per capita per year

As on 18.11.2015

State and Central Universities of Punjab, Haryana and UT as per Research Gate, USA

Rank	Year of Establishment	Institutions Ranking in India	Name of The University	Total RG Score	RG Score per capita per Year	State
1	2009	173	Central University of Punjab	1341.58	223.60	Punjab
2	2005	201	Guru Angad Dev Veterinary & Animal Sciences University	1188.90	118.89	Punjab
3	1947	26	Panjab University	6479.83	95.29	UT
4	2010	435	Lala Lajpat Rai University of Veterinary & Animal Sciences	437.24	87.45	Haryana
5	1962	84	Punjab Agriculture University	3434.11	64.79	Punjab
6	1969	91	Guru Nanak Dev University	2580.32	56.11	Punjab
7	1995	220	Guru Jambeshwar University of Science and Technology	1057.11	52.86	Haryana
8	1976	155	Maharishi Dayanand University	1481.50	37.99	Haryana
9	1962	118	Punjabi University, Patiala	1980.17	37.36	Punjab
10	1957	112	Kurukshetra University	2069.20	35.68	Haryana
11	1997	380	Punjab Technical University	539.15	29.95	Punjab
12	2003	651	Chaudhary Devi Lal University	247.37	20.61	Haryana
13	1970	297	Choudary Charan Singh Haryana Agricultural University	733.98	16.31	Haryana
14	1987	482	Deen Bandhu Chhotu Ram University of Sciences & Tech.	379.28	13.35	Haryana
15	1998	992	Baba Farid University of Health Sciences	127.65	7.51	Punjab
16	2009	1978	Central University of Haryana	40.38	6.73	Haryana
17	2014	3718	Chaudhary Ranbir Singh University	6.71	6.71	Haryana
18	1969	1453	YMCA University of Science & Technology	65.90	1.43	Haryana
19	2006	4185	Bhagat Phool Singh Mahila Vishwavidyalaya	2.79	0.31	Haryana
20	2006	4793	Rajiv Gandhi National University of Law	0.08	0.01	Punjab
21	2011		Guru Ravidass Ayurved University	no account		Punjab
22	2014		Ch. Bansi Lal University	no account		Haryana
23	2008		Pt. Bhagwat Dayal Sharma University of Health Sciences	no account		Haryana
24	2014		State University of Performing and Visual Arts	no account		Haryana
25	2015		Maharaja Ranjit Singh State Technical University	no account		Punjab

Relative Ranking RG Score of New Central Universities of India as per Research Gate, USA

As on 10.12.2015

Sr. No.	Name of The University	Institutions ranking in India (as per RG Score)	RG SCORE
1	Central University of Punjab	172	1366.61
2	Central University of Rajasthan	225	1061.43
3	Central University of Jharkhand	356	597.56
4	Central University of Tamil Nadu	450	425.74
5	Central University of Gujarat	489	381.47
6	Central University of Kerala	495	378.3
7	Central University of Bihar	497	373.45
8	Central University of Himachal Pradesh	649	200.40
9	Central University of Karnataka	1004	128.1
10	Central University of Haryana	1961	40.76
11	Central University of Jammu	2020	39.45
12	Central University of Orissa	2909	18.33
13	Central University of Kashmir	2936	17.97

The RG Score measures reputation & impact, based on how a researcher's work is received by their peers. This list shows institutions by the sum of the RG Scores of their individual members using ResearchGate

15.12.2015 VC-CUP 21

Relative Ranking Impact Points of New Central Universities of India as per Research Gate, USA

As on 10-12-2015

Sr. No.	Name of The University	Institutions ranking	Total Impact Points
1	Central University of Punjab	277	400.54
2	Central University of Bihar	638	101.04
3	Central University of Kashmir	748	77.71
4	Central University of Rajasthan	1501	26.21
5	Central University of Gujarat	1509	21.11
6	Central University of Tamil Nadu	1638	[illegible]
7	Central University of Jharkhand	2014	6.89
8	Central University of Himachal Pradesh	2240	6.03
9	Central University of Kerala	2759	2.93
10	Central University of Karnataka	3023	1.70
11	Central University of Haryana		
12	Central University of Jammu		
13	Central University of Orissa		

Impact Points are calculated based on which journals a researcher has been published in. This list shows institutions based on the sum of the impact points of publications attributed to them

15.12.2015 VC-CUP 22

NAAC Accreditation

- Final Report submitted to NAAC, Bangalore on 9th October 2015.
- NAAC office has sent additional 50 questions to which reply has been sent.
- Visit of NAAC team awaited.
- NAAC has sought 3 suitable dates.

15.12.2015 VC-CUP 23

MOOCs (Massive Open Online Courses)

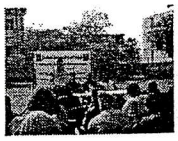
- Registered the University in edX platform for uploading MOOC courses
- The coordinator Dr. Jubilee Padmanaban, Asst Prof is educating the faculty.
- Three have already recorded some lectures; more to be recorded shortly.
- However, we are waiting for better, uninterrupted and fast connectivity.
- 29 courses are being developed by 41 faculty from different Centres of CUPB. The courses to be developed in each Quarter starting from 1st October 2015 to 30th September 2016.
- Installed MOODLE onto the server of CUPB ; IP address for Moodle at CUPB is 172.16.60.55.

15.12.2015 VC-CUP 24

Commemoration of Birth Anniversary of Sardar Vallabhbhai Patel

22nd November 2015

Birth Anniversary of **Sardar Vallabhbhai Patel** was celebrated on **22nd November 2015** (Sunday) in the Central University of Punjab. Different activities like Lecture on Contribution of Sardar Vallabh Bhai Patel, Skit on Human Rights and Poster Presentation Competition were organized. Faculty and Students from all the Centers were present.

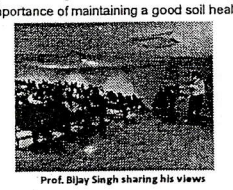


Glimpses from the commemoration

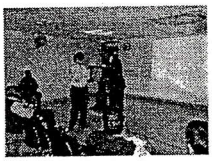
Invited Lecture on "Why aren't we talking about soils and soil security"

26th November 2015

Prof. Bijay Singh, *FNA, FNASc, FNAAS, FISS* from Deptt. of Soil Sciences, PAU Ludhiana delivered an invited talk on **"Why aren't we talking about soils and soil security?"** on 26th November 2015 as part of the observance of "International Year of Soils - 2015". Profound significance of the soil health to humanity in general, and agriculture in particular, was discussed. Knowledge gaps on understanding of soil were explained before concluding with a call for sensitizing the public on the importance of maintaining a good soil health.



Prof. Bijay Singh sharing his views

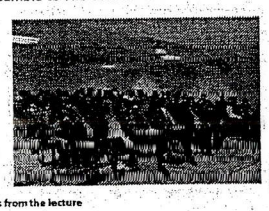


Vice Chancellor felicitating Prof. Bijay Singh

Law Day Celebrations

26th November 2015

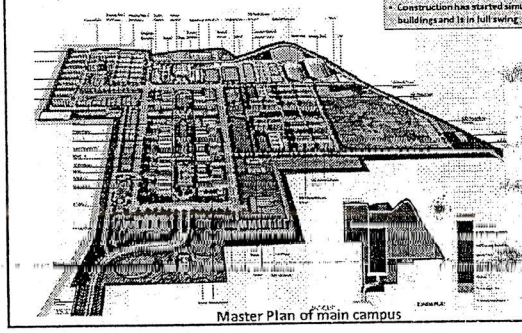
Central University of Punjab, Bathinda celebrated **LAW DAY** on 26th Nov 2015 (Thursday). The speakers present their views on Constitutional Governance, Dr. B. R Ambedkar's Contribution on Social Justice and The Preamble to The Constitution of India.

Glimpses from the lecture

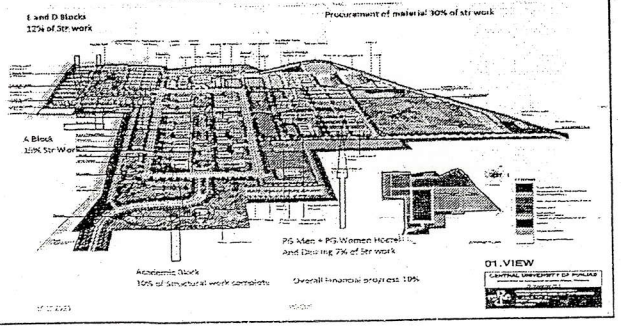
Main Campus Master Plan

- Consent to Establishment of Phase – 1a granted
- Foundation Stone Laying Ceremony on 7.9.2013
- Construction has started simultaneously for all buildings and is in full swing



Master Plan of main campus

Main Campus -Work Progress



Annexure - 19.3

From DAA to VC

Subject: Case of Dr. Zameerpal Kaur for the post of Associate Professor

1. As per UGC Regulations on Minimum qualifications for appointment of teachers..... .....in higher education (2010), 8 years of experience after Ph.D. is required for any candidate to be appointed as Associate Professor.
2. Dr. Zameerpal Kaur worked as Assistant professor at CUPB from 21.10.09 to 20.09.11 (23 months on contract basis) and from 21.09.2011 to 31.08.2015, the last date to apply for the post under consideration (47 months, 10 days on regular basis).
3. Therefore, her total teaching experience at CUPB is 70 months and 10 days.
4. Prior to joining CUPB, she was awarded Ph.D. in April 2004 after which she worked as UGC Part Time Research Associate to women candidates from 19.04.2004 to 18.04.2009 (5 years – 1825 days) at Punjabi University, Patiala. This scheme has been renamed as UGC PDF for women candidates in May, 2015.
5. As per terms and conditions of award, the UGC Part Time Research Associates are not allowed to accept any appointment during the award period. (P. 38)
6. Punjabi University treats 500 days of part time experience equivalent to 1 year of full time experience for appointment on teaching positions in the university.
7. Taking this into consideration the 1825 days of part time experience of Dr. Zameerpal kaur is equal to 3.65 years or 43.7 months.
8. Thus the total experience of Dr. Zameerpal Kaur is more than 8 years as per following detail:

Experience at CUPB = 70 months and 10 days
Experience at Punjabi University = 43 months and 21 days
Total experience = 114 months or 9 years and 6 months

Put up for consideration

(P. Ramarao) P Rama Rao
DAA 07/12/2015

Put up for consideration of EC this analysis and the evidences on the file in the meeting of 15th December

7/12/15

8765
9/12/15

To Rg and Secretary, EC
Please do the needful

Annexure-19.4

Date 11th June,2015.

To

The Registrar
Central University of Punjab
City Campus, Mansa Road
Bathinda – 151 001

Subject: Show Cause Notice – Submission of reply thereto.

Respected Sir,

With reference to my reply submitted in the stipulated period against allegation no.1 at page no.1 in line no. 5 the word 'had' falling in between 'I' and 'not' be substituted with the word 'was'.

Other things remain the same.

Thanking You

Yours sincerely,

Poonam Rani 11/5/15

(Ms. Poonam Rani)

Upper Division Clerk

Central University of Punjab

Bathinda

11/6/15

UDC, V.C. office to attach with the file.

DAA

12/6/15

Registrar

9133
15/6/15

To Registrar
Pl look into the file
15/6/15

Please put up a bee direction at SC please.

(1537)

To

The Registrar
Central University of Punjab
City Campus, Mansa Road
Bathinda – 151 001

Subject: Show Cause Notice – Submission of reply thereto.

Respected Sir,

Kindly refer to your show cause notice bearing no. CUPB/CC/2015/PF/SCN/1565 dated 22.5.2015, served upon the undersigned, requiring her to submit reply in defence, if any, within the period of 21 days from the date of issuance of this show cause notice, failing which it would be presumed that the undersigned have nothing to say in this regard. A detailed reply to the above mentioned show cause notice is being submitted within the stipulated period of 21 days, for your kind and sympathetic consideration as under:-

1. That the allegations leveled against the undersigned are false, motivated, based on flimsy grounds, are liable to be withdrawn.
2. The undersigned, respectfully submits the allegation-wise reply as under:-

Allegation No. 1

The allegation that the undersigned had lost the record relating to Ms. Shweta Arora regarding her previous experience and other qualification are absolutely wrong, hence specifically denied in repudiation, it is however, submitted that I had not handed over any record respecting the appointments made in 2009-2010.

So the question of destruction and misplacement of the previous experience and other qualification of Ms. Shweta Arora by the undersigned does not arise. Moresoever, the show cause notice is ambiguous because the necessary particulars, dates, years etc. to which the alleged lose of documents relate is not mentioned therein.

Allegation No. 2

That the allegation leveled against the undersigned is absolutely wrong, hence strongly denied. In repudiation, it is however, submitted that due to inadvertence or typographical mistake the words "till date continually" after the words April 1, 2005 in line number 3 of the certificate has been mentioned. The Principal, Arya Model High School, Bathinda (now Arya Model Sr. Sec. School, Bathinda) has issued a correct certificate strictly in accordance with the record. The Certificate regarding the work and conduct of the undersigned has already been submitted. A copy of the fresh certificate is enclosed. It is further submitted that the previous certificate does not have any impact on the merit in selection.

Allegation No.3

It is all to gather wrong that the undersigned had become instrumental in influencing the change in the qualification for the post of UDC in the Advertisement No. NT-11 (2013) as compared to Advertisement i.e. NT-05 (2013) wherein the application of the undersigned was not short listed. The undersigned was

working as Computer Operator against the post of LDC on contract basis and joined LDC on regular basis on 24th Sept. 2013 as such she was not in a position to become instrumental in influencing the change in the qualification for the post of UDC. The undersigned had applied having the qualification as required in the advertisement.

Allegation No. 4

In reply to allegation no. 4 it is stated that no prudent person can stomach that a person working on the contractual basis as Computer Operator against the post of LDC or LDC can manipulate the conditions of short listing of applications for the post of UDC. So this allegation is absolutely wrong, hence specifically denied.

Allegation No. 5

That the allegations leveled against the undersigned in Item No. 5 are wrong, hence strongly denied. It is however, in repudiation stated that during the span of long services of the undersigned her work and conduct has been found to be satisfactory and no adverse remarks have been passed and delivered to the undersigned.

Allegation No. 6

That the undersigned has never violated the Central Government Employees Conduct Rules.

3. That it is well settled principle of natural justice and a golden rule of modern service jurisprudence that every delinquent.

facing contemplating departmental proceedings, has a right not only of defence but the departmental authority is bound to issue a show cause notice in detail to enable the delinquent to under stand the allegations properly and he/she must submit his/her reply to the show cause notice properly comprehensively and in detail. At the first blush the show cause notice served upon the delinquent appears to be well woven but if the veil is lifted it would be manifestly clear that no reason or hints under which the allegations have been leveled against the undersigned have been given. Moreover, it (show cause notice) is infact a charge sheet without supporting the documents/letters in support of the allegations with which the undersigned has been tethered, with the result the undersigned has been made handicapped to submit her reply to the allegations/charges. Moreover, it is evident that a preliminary enquiry has been held in the absence of the undersigned and no such copy of the preliminary report accompanied with the relevant documents on which the undersigned has been found to be guilty of misconduct and loss of documents given to the undersigned. As submitted above, the undersigned had been working against a lower post and not working or performing the duties of a custodian of record. Thus she can not be held responsible for having lost the previous experience and other qualification of Ms. Shweta Arora. Thus the allegations are motivated. As stated above the supply of a copy of preliminary enquiry report accompanied by the relevant record has not been supplied which was mandatory to be supplied to the undersigned to enable her to understand the false allegations leveled against her and submit convincing reply to the show cause notice. In this connection a reference is invited to the observations made by the Hon'ble judges in the case, a nut shell therof is reproduced below:-

(i) Hans Raj Gupta Versus State of Punjab 1992 (1) RSJ 462.

"Preliminary Enquiry Report (Audit Report) which was the basis of the guilt – against the petitioner had to be supplied to the petitioner so that he could properly defend himself. It has certainly prejudiced his defence and the whole enquiry proceedings are liable to be set aside on this point alone".

4. That as stated above that the allegations made against the undersigned are motivated with interior motive. It appears that some person has been nursing ill-will, malice and grudge against the undersigned and wants to get rid of the undersigned so as to make a room to adjust a person of his choice in place of the undersigned. It thus lends credence that a show cause notice which is not proper and ambiguous issued to deprive to her from submitting the comprehensive reply to the show cause notice. There is a catena of judicial verdicts to the effect that a show cause notice/charge sheet which materially suffers from the blemish of ignoring or overlooking willfully or otherwise vital provision of rules or observations made by the judicial courts bearing on the matter is bad. Likewise any action which digs up absolute, circumstance and obsessively reaches a decision based on the defective show cause notice can not be sustained in the eyes of law. As stated above that the show cause notice is not

proper which has been given to the undersigned with interior motive.

5. That is well settled and right to life conferred under Article 21 includes the right to livelihood, the depriving of an employee from the livelihood. The employee can not be deprived from the fundamental right of livelihood. In this connection a reference is invited to the verdict rendered by the Hon'ble Judge in the case, a nut shell thereof is reproduced below:-

> **Constitution of India, Article 14, 21 and 226 – Natural Justice – Right to life conferred u/Article 21 includes the right to livelihood. Depriving of from source of livelihood in utter violation of principles of natural justice and fair play violate the right to life.**

As stated above that the show cause notice as served upon the undersigned is defective and simply has given the same to the undersigned to adjust to some other person and if so, the entire family of the undersigned may lead to starvation. A reliance in this regard is placed on the following judgment rendered by the Hon'ble Judges, a nut shell is reproduced below:-

> State of Kerala Versus Mohanan 2000 (1) SCT 963. Administrative Order – Natural Justice – Civil consequences – old distinction between a judicial act and administrative act has withered

(931)

away -- Even an administrative order which involves civil consequences must be consistent with rules of natural justice.

In view of the foregoing submissions and corollary of the judicial Authorities, quoted above, it is prayed that the Show Cause Notice, in question, may kindly be withdrawn.

Trusting, justice will be administered to the undersigned at your Honour's benevolent hands, for which the undersigned, as duty bound, shall pray to Almighty for your prosperity and longevity.

With profound respects.

Dated: 9th June, 2015.

Submitted by

Poonam Rani 9/6/15

(Ms. Poonam Rani)
Upper Division Clerk
Central University of Punjab
Bathinda

Encl.: A copy of certificate

Annexure - P. 5

पंजाब केन्द्रीय विश्वविद्यालय

Central University of Punjab

registrar@cup.ac.in
www.cup.ac.in
91-164-2864106

Dr. Pankaj Khare
Registrar

Ref. No. CUPB/CC/Estab./PF/2015/9506

Dated 21/10/2015

CHARGE SHEET

Ref: Letter No: CUPB/CC/2015/PF/SCN/1565 dated 22/05/2015
Reply dated: 11/06/2015 on the Show Cause Notice of the University
EC Decision : Item No. 16:2015:13 of 16th Executive Council Meeting

As directed by the Executive Council an inquiry under the procedure laid down, as set out in the statement of articles of charges as detailed below against Ms. Poonam Rani, UDC, CUPB:

1. You influenced the change in the qualification for the post of UDC in the advertisement no. NT-11(2013) as compared to previous advertisement i.e NT-05(2013) wherein your application was not shortlisted and led management in taking prejudice decision.

2. In the advertisement issued vide No: NT-05 (2013) dated 25.05.2013 the minimum qualification was graduate in any discipline with at least 50% marks along with other things in which your application was not considered to be eligible for interview and was rejected by the screening committee citing reasons as "post Qualification experience less than three years". However, when the post was re-advertised vide no: NT-11(2013) dated 01.11.2013 the qualification was amended as "Graduate in any discipline with good academic record .." as per which your application was not screened out by the committee and subsequently you were selected as UDC. This clearly shows that you misused your position in manipulating the eligibility conditions along with the conditions of short-listing of applications for the post of UDC to seek appointment as UDC against the advt. No. NT-11 (2013) as at that time you along with the then Assistant Registrar was working in the office of the Vice Chancellor.

3. As per advertisement No: NT-11(2013) you were not eligible as per approved eligibility conditions and got selected by influencing the selection procedure being in the office dealing with the selections. Therefore, as per CCS (conduct) rules 3 (iii) your selection is subject to withdrawal.

4. The minimum eligibility for the post of UDC advertised vide Advt. No.: NT-11(2013) was Graduate in any discipline with good academic records and three years of experience as Jr. Office/Jr. Asstt./LDC. However, as per records available with the Office of the Registrar your work experience is less than three years after your graduation with more than 50% marks that makes your selection as UDC null and void and is subject to withdrawal.

You are hereby directed to submit within 15 days of the receipt of this Charge Sheet a written statement in defence.

You must note that inquiry will be initiated only in respect of articles of charges that are not admitted. you should, therefore, specifically admit or deny each article of charge.

21/10/15
Registrar

The receipt of the memorandum be acknowledged.

Ms. Poonam Rani
Upper Division Clerk
Central University of Punjab
Bathinda - 151 001

Annexure 19.6

To

The Registrar
Central University of Punjab
City Campus
Mansa Road
Bathinda – 151 001

Subject: Charge Sheet against Ms. Poonam Rani, UDC, Central University of Punjab, Bathinda – Submission of Written Statement thereto.

Respected Sir,

Kindly refer to your Charge Sheet bearing No. CUPB/CC/Estab./PF/2015/2506 dated 21.10.2015, served upon the undersigned, requiring her to submit Written Statement in defence, within the period of 15 days of the receipt of the charge sheet. The Written Statement in defence is being submitted, within the stipulated period of 15 days, for your honour's kind and sympathetic consideration:-

(a) That the charges levelled against the undersigned from Serial No. 1 to 4 are false, motivated, based on flimsy grounds and are liable to be withdrawn on the grounds submitted below:-

Before the undersigned takes up the matter regarding the charges Nos. 1 and 2 levelled in the charge sheet served upon the undersigned, it is submitted that in the show cause notice served upon the undersigned on 22.05.2015, it is particularly mentioned that the undersigned had lost the record relating to Ms. Shweta Arora regarding her previous experience and other qualification have been omitted from the charge sheet rather a different charges Nos1 and 2 containing different language, omitting the name of Ms. Shweta Arora, it clearly suggest that the reply given by the undersigned in the show cause notice, has been changed simply to defeat the plea/cause of the undersigned. This allegation was very serious and a detailed reply to this allegation was given by the undersigned. Thus the charges Nos 1 and 2 in which the matter regarding the loss of documents relating to Ms. Shweta Arora has been omitted, are liable to be withdrawn, which action is absolutely wrong, hence specifically denied.

The matter involved does not raise any intricate question of law but abundantly exposes the callous attitude of the Competent Authority that he had not permit a peep into his mind that the allegation regarding the loss of documents of Ms. Shweta Arora intentionally by the undersigned is very serious. But the Competent Authority has intentionally omitted the above said allegation which goes in favour of the undersigned because the charge was absolutely motivated and with some ulterior consideration such as to adjust any other person in place of the undersigned. So these charges Nos 1 and 2 are levelled to be withdrawn on this score alone.

Charges Nos 1 and 2

A detailed reply to the charges Nos 1 and 2 is given as under:-

That it is altogether wrong that the undersigned had become instrumental in influencing the change in the qualification for the post of UDC in the Advertisement No. NT-11 (2013) as compared to Advertisement i.e. NT-05/2013 wherein the application of the undersigned was not short listed. The undersigned was working as Computer Operator against the post of LDC on contract basis and as such she was not in a position to become instrumental in influencing the change in the qualification for the post of UDC. The undersigned had applied having the qualification as required in the advertisement. Moreover, it is further stated that no prudent person can stomach that a person working on contractual basis as Computer Operator against the post of LDC or LDC can manipulate the conditions of short listing of applications for the post of UDC. So the charges Nos 1 and 2 are absolutely wrong, and motivated and based on flimsy grounds, hence specifically denied.

Charges Nos 3 and 4

That the above charges are vague in nature, absolutely false, fabricated, motivated with ulterior motives to deprive the undersigned from legitimate right of livelihood enshrined in the Constitution of India. The undersigned has not violated the Central Civil Service (Conduct Rules). In fact the undersigned has fulfilled the eligibility criteria against the Advertisement No. NT-11(2013) dated 01.11.2013 and subsequently the selection and appointment of the undersigned was made on the post of UDC by the Competent Authority. The allegations made in the above said charges Nos 3 and 4 are absolutely wrong, hence specifically denied.

In fact, I was eligible for the post of UDC when the same was advertised vide NT-5(2013) on 27.5.2013 and simultaneously applied for both UDC as well as LDC. Again I applied for the post of UDC when it was again advertised vide NT 11 (2013) issued on 1st Nov.2013 - my name was shortlisted and subsequently appointed UDC by authority competent.

1. That it is well settled principle of natural justice and a golden rule of modern service jurisprudence that every delinquent, facing contemplating departmental proceedings, has a right not only of defence but the departmental authority is bound to issue a Charge Sheet in detail to enable the delinquent to understand the allegations properly and he/she must submit his/her reply to the Charge Sheet properly comprehensively and in detail. At the first blush the Charge Sheet served upon the undersigned appears to be well woven but if the veil is lifted it would be manifestly clear that no reason or hints under which the allegations have been levelled against the undersigned have been given. Moreover, the charge sheet issued to the undersigned is not supported with the documents/letters in support of the allegations with which the undersigned has been tethered, with the result the undersigned has been made handicapped to submit her

reply to the charges. Moreover, it is evident that a preliminary enquiry has been held in the absence of the undersigned and no such copy of the preliminary report accompanied with the relevant documents which are mandatory to be supplied to the delinquent along with the charge sheet to enable the delinquent to submit her proper and sound reply to the charge sheet been given. As required the copies of the preliminary enquiry report accompanied by the relevant record has not been supplied to the undersigned which was mandatory to be supplied to undersigned to enable her to understand the false allegations levelled against her and submit convincing reply to the Charge Sheet. In this connection a reference is invited to the observations made by the Hon'ble judges in the case, a nut shell thereof is reproduced below:-

(i) Hans Raj Gupta Versus State of Punjab 1992 (1) RSJ 462.
"Preliminary Enquiry Report (Audit Report) which was the basis of the guild – against the petitioner had to be supplied to the petitioner so that he could properly defend himself. It has certainly prejudiced his defence and the whole enquiry proceedings are liable to be set aside on this point alone."

(ii) State of Punjab Versus Kuldeep Singh 1997 (2) RSJ 740.
Departmental Enquiry – obligation on part of the disciplinary Authority to ensure the supply of charge sheet statement of imputation, documents and statements supporting such charge sheet and further list of documents which the department wises to rely upon during the course of enquiry. Non furnishing of these documents which have seriously prejudice the case of the delinquent would render official at all stages, no compliance of statutory rules would have the effect of violating the enquiry proceedings.

2. That as stated above that the allegations made against the undersigned are motivated and with ulterior motive. It appears that some person has been nursing ill-will, malice and grudge against the undersigned and wants to get rid of the undersigned so as to make a room to adjust a person of his choice in place of the undersigned. It thus lends credence that a Charge Sheet which is not proper but ambiguous to deprive to her from submitting the comprehensive reply to the Charge Sheet. There is a catena of judicial verdicts to the effect that a Charge Sheet/Allegation which materially suffers from the blemish of ignoring or overlooking wilfully or otherwise vital provision of rules or observations made by the judicial courts bearing on the matter is bad. Likewise any action which digs up absolute circumstance and obsessively reaches a decision based on the defective Charge Sheet can not be sustained in the eyes of law. As stated above that

the Charge Sheet is not proper which has been given to the undersigned with ulterior motive.

3. That it is well settled and right to life conferred under Article 21 includes the right to livelihood. The depriving of an employee from the livelihood. The employee can not be deprived from the fundamental right of livelihood. In this connection a reference is invited to the verdict rendered by the Hon'ble Judge in the case, a nut shell thereof is reproduced below:-

> Constitution of India, Article 14, 21 and 226 – Natural Justice Right to life conferred u/Article 21 includes the right to livelihood – Depriving of, from source of livelihood in utter violation of principles of natural justice and fair play violate the right to live.

In Harjinder Singh v. Punjab State Warehousing Corporation, Hon'ble Judge opined that

> "It need no emphasis that if a man is deprived of his livelihood, he is deprived of all his fundamental and Constitutional rights and for him the goal of social and economic justice, equality of status and of opportunity the freedom enshrined in the Constitution remain illusory."

As stated above that the Charge Sheet as served upon the undersigned is defective and simply has been given the same to the undersigned to adjust to some other person and if so the entire family of the undersigned may lead to starvation. A reliance in this regard is placed on the following judgement rendered by the Hon'ble Judges, a net shell is reproduced below:-

> State of Kerala Versus Mohanan 2000 (1) SCT 963. Administrative Order – Natural justice – Civil consequences – old distinction between a judicial act and administrative act has withered away – Even an administrative order which involves civil consequences must be consistent with rules of natural justice.

That in the departmental enquiries Article 311 of the constitution of India has to be made applicable in each and every enquiry/proceedings. The mandatory Article 311 of the constitution of India being law of the land govern all services regulations, but in the present case the compliance of the Article 311 of the constitution of India has not been made. So the charge sheet is vague and liable to be withdrawn. In this connection, reliance in this regard is placed on the following judgement rendered by the Hon'ble Judges, a net shell is reproduced below:-

> Rattan Singh Versus Sainik School Society 2002(4) SCT 714.
> Departmental Proceedings – Sainik School Society Rules Regulations are subject to Article 311 of the constitution of India – The employees of Sainik School

are not employees belongs to defence services subject to article 33 Article 311 of the constitution being the law of the land govern all service regulations.

In view of the foregoing submissions and corollary of the judicial authorities, quoted above, it is prayed that the Charge Sheet in question, may kindly be withdrawn.

Trusting justice will be administered to the undersigned at your Honour's benevolent hands, for which the undersigned, as duty bound, shall pray to Almighty for your prosperity and longevity.

With profound respects,

Submitted by

Poonam Rani

4/11/15

(Ms. Poonam Rani)
Upper Division Clerk
Central University of Punjab
Bathinda

पंजाब केन्द्रीय विश्वविद्यालय

Central University of Punjab

Established vide Act No. 25 (2009) of Parliament

Annexure-19.7
137

Proceeding of the Standing Committee for making recommendation of Non-Compounded Ph.D. increments to the faculty of CUP

The Committee constituted vide Office Order No. 80 dated 19.08.2015 met in the Conference Room of the Administrative block on 05/11/2015 at 10:30 AM and discussed all the individual cases for granting of Ph.D. increments as per UGC guidelines.

The committee deliberated on all the requests of the newly joined faculty member's and also of the faculty members in whose favour Ph.D. increments are yet to be granted and recommended the following:

S. No	Name	Centre	Date of Joining on Regular Basis	Date of Ph.D	Ph.D with Course work /Without course work	Number of Non Compounded Increments recommended by the Committee
1	Dr. Rajendra Singh Dhayal	Centre for Chemical Sciences	13.7.2015	2011	Yes	5
2	Dr. Sachin Kumar	Centre for Mathematics and Statistics	13.7.2015	2012	Yes	5
3.	Dr. Krishna Kanta Haldar	Centre for Chemical Sciences	13.7.2015	2012	Yes	5
4.	Dr. Anoop Kumar	Centre for Mathematics and Statistics	13.7.2015	2014	Yes	5
5.	Dr. Shashank Kumar	Centre for Biochemistry & Microbial Sci.	13.7.2015	2015	Yes	5
6.	Dr. Ajay Kumar	Centre for Animal Sciences	13.7.2015	2013	Yes	5
7.	Dr. Jainendra Kumar Verma	Centre for Economic Studies	13.7.2015	2014	Yes	5
8	Dr. Dinesh Babu P.	Centre for Classical & Modern Languages (Punjabi Language, Literature and Culture: English)	27.7.2015	2014	Yes	5
9.	Dr. Pradeep Kumar	Centre for Pharmaceutical Sciences and Natural Products	31.7.2015	2013	Yes	5
10.	Dr. Surender Mehra	Centre for Law	03.8.2015	2015	Yes	He is on lien and was awarded his Ph.D degree during his services at Banaras Hindu University, Varanasi. The committee recommends that 05 increments be released upon production of certificate from BHU that he has not claimed these at BHU.
11.	Dr. Jitendra Kumar Pattanaik	Centre for Geography & Geology	03.8.2015	2010	Yes	3 increments recommended till the time he submits the proof that he has done his Ph.D with course work. On submission of such proof additional 02 increments be granted.
12	Dr. Sabyasachi Senapati	Centre for Human Genetics	04.8.2015	2014	No (claiming exemption of coursework as he is also M.Phil)	3 Increments recommended till the time he submits the proof that he has done his Ph.D with course work. On submission of proof additional 02 increments be granted.
13	Dr. [illegible] Vasang Gunte	Centre for Geography & Geology	06.8.2015 (AN)	2012	Yes	

पंजाब केन्द्रीय विश्वविद्यालय

Central University of Punjab

Established vide Act No. 25 (2009) of Parliament

14	Dr. Jajati Keshari Parida	Centre for Economic Studies	07.8.2015	2013	Yes	3
15	Dr. Aditya Ranjan Kapoor	Centre for Sociology	10.8.2015 (A.N.)	2009	~~Yes~~ NO	~~3~~ MPhil Only 2 increments
16	Dr. Jyoti Parkash	Centre for Animal Sciences	13.7.2015	2008	No	3
17	Dr. Rakesh Kumar	Centre for Chemical Sciences	13.7.2015	2012	No	3
18	Dr. Sukhwinder Kaur	Centre for Law	13.7.2015 (AN)	2013	No	3 for Ph.D (without Coursework) + 2 increments for LLM
19.	Dr. Ashok Kumar	Centre for Physical Sciences	13.7.2015	2013	No	3
20.	Dr. Sesadeba Pany	Centre for Education	17.7.2015	2005	No	3
21.	Dr. Krishna Chaitnaya Rapalli	Centre for Animal Sciences	31.7.2015	2010	No	3
22	Dr. Neeraj Kumar	Centre for Human Genetics & Molecular Medicine	07.8.2015	2010	No	3
23.	Dr. Vinay Kumar	Centre for Plant Sciences	10.8.2015	2013	No	3
24.	Dr. K. Milankumar Sharma	Centre for Geography and Geology	31.8.2015	2013	No	3
25.	Dr. Vinod Arya	Centre for Sociology	29.7.2015	2014	He is claiming that he has done Integrated M.Phil. Ph.D programme because of which he has done coursework only once during M.Phil.	3
26.	Dr. Sudheer Singh Verma	Centre for South & Central Asian Studies	05.8.2015			3
27	Dr. Jubilee Padmanabhan	Centre for Education	30.12.2014	2013	No	3

The recommendations of the Committee are submitted for consideration and approval of the Competent Authority.

Prof. S.K.Bawa
COC
Centre for Education

Dr. Pankaj Khare
Registrar
6/11/XV

Sh. C.L Bansal
Accounts Officer

Gautam Sha.
Assistant Registrar

Prof. Ashok Dhawan
COC
Centre for Plant Sciences
6/11

प्रो (डॉ.) जसपाल एस. सन्धू
सचिव
Prof. Dr. Jaspal S. Sandhu
MBBS, MS (Ortho), DSM, FAIS, FASM, FAFSM, FFIMS, FAMS
Secretary

विश्वविद्यालय अनुदान आयोग
University Grants Commission
(मानव संसाधन विकास मंत्रालय, भारत सरकार)
(Ministry of Human Resource Development, Govt. of India)
बहादुरशाह ज़फ़र मार्ग, नई दिल्ली-110002
Bahadur Shah Zafar Marg, New Delhi-110002
Ph.: 011-23239337, 23236288,
Fax : 011-23238858, email : jssandhu.ugc@nic.in

By Speed Post

D.O. No.F.12-1/2010(PS)

17th August, 2015

Dear Sir/Madam,

UGC had framed UGC Regulations (Minimum Qualifications for Appointment of Teachers and other Academic Staff in Universities and Colleges and Measures for the Maintenance of Standards in Higher Education), 2010, which have been notified in the Gazette of India dated 18th-24th September, 2010. The UGC has been receiving a number of queries from Universities, Colleges and stakeholders seeking clarification regarding the date of eligibility of candidates, who acquire Ph.D./M.Phil. after four years but within six years from the date of their appointment, for their promotion from Stage I to Stage II (AGP Rs.6000 to AGP Rs.7000). The matter has been examined by UGC with regard to the provision contained in the Clause 1.1 of Schedule for Clause 6.8.0 of these Regulations which states as under:-

1.1 *An Assistant Professor with completed service of four years, possessing Ph. D. Degree in the relevant discipline shall be eligible, for moving to AGP of Rs.7,000.*

It is clarified that an Assistant Professor who completes Ph.D. or M.Phil. Degree within 4 or 5 years from the date of his/her appointment shall also be eligible for moving from the AGP of Rs.6000/- to AGP of Rs.7000/- after completion of 4 and 5 years of his/her service respectively. Further, if the incumbent acquires Ph.D./M.Phil. after completion of 4 years of service/5 years of service and before 6 years of service respectively, he/she shall be eligible to move to Stage II (AGP Rs.7000) from the date of award of Ph.D./M.Phil. Degree subject to the fulfillment of other conditions stipulated in UGC Regulations (Minimum Qualifications for Appointment of Teachers and other Academic Staff in Universities and Colleges and Measures for the Maintenance of Standards in Higher Education), 2010, for the same. Provided; that the Ph.D./M.Phil. Degree awarded by the University is in the relevant subject, following the process of admission, registration, course work and external evaluation as per above regulations.

However, the claim of advance increments for possessing Ph.D./M.Phil. Degree as mentioned above shall be strictly as per clause 9.4(i) and 9.7 of schedule for clause 6.8.0 of UGC Regulations, 2010.

This may be brought to the notice of the Colleges affiliated to your University.

With regards,

Yours sincerely,

(Jaspal S. Sandhu)

The Vice-Chancellor
Central University of Punjab
City Campus, Mansa Road
Bathinda-151001

Pulip circulate — Registrar/DAA
— Circulate - Faculty
DR(A)

8.0. PAY SCALES OF PRO-VICE CHANCELLOR / VICE-CHANCELLOR OF UNIVERSITIES:

8.1. PRO-VICE-CHANCELLOR:

8.1.1. The posts of Pro-Vice Chancellor shall be in the Pay Band of Rs. 37,400 –Rs 67,000 with AGP of Rs.10,000 or Rs.12,000 as the case may be, along with a Special Allowance of Rs. 4,000 per month, subject to the condition that the sum total of pay in the Pay Band, the Academic Grade Pay and the Special Allowance shall not exceed Rs. 80,000.

8.2. VICE CHANCELLOR:

8.2.1. The posts of Vice-Chancellor shall carry a fixed pay of Rs.75,000 along with a Special pay of Rs.5,000 per month. All other eligibilities and facilities for the Vice Chancellor as provided in the Act/Statute of the university concerned, shall be applicable besides the pay.

9.0. **INCENTIVES FOR Ph.D. / M.Phil. AND OTHER HIGHER QUALIFICATION TO TAKE EFFECT FROM 01-09-2008.**

9.1. Five non-compounded advance increments shall be admissible at the entry level of recruitment as Assistant Professor to persons possessing the degree of Ph.D. awarded in a relevant discipline by the University following the process of admission, registration, course work and external evaluation as prescribed by the UGC.

9.2. M.Phil. Degree holders at the time of recruitment to the post of Assistant Professor shall be entitled to 2 non-compounded advance increments.

9.3. Those possessing Post-graduate degree in the professional course such as LL.M./M.Tech./M.Arch./M.E./M.V.Sc./M.D., etc. recognized by the relevant statutory body / council, shall also be entitled to 2 non-compounded advance increments at the entry level.

9.4 (i) Teachers who complete their Ph.D. Degree while in service shall be entitled to 3 non-compounded increments if such Ph.D. is in a relevant discipline of the discipline of employment and has been awarded by a University complying with the process prescribed by the UGC for enrolment, course work, evaluation, etc.

(ii) However, teachers in service who have already been awarded Ph.D. by the time of coming into force of these Regulations or having been enrolled for Ph.D. have already undergone course-work as well as evaluation, if any, and only Notification in regard to the award of Ph.D. is awaited, shall also be entitled to the award of 3 non-compounded increments even if the

university awarding such Ph.D. has not yet been notified by the UGC as having complied with the process prescribed by the Commission.

9.5. In respect of every other case, a teacher who is already enrolled for Ph.D. shall avail the benefit of 3 non-compounded increments only if the university awarding the Ph.D. has been notified by the UGC to have complied with the process prescribed by the Commission for the award of Ph.D. in respect of either course-work or evaluation or both, as the case may be.

9.6 Teachers in service who have not yet enrolled for Ph.D. shall therefore derive the benefit of 3 non-compounded increments on award of Ph.D., while in service only if such enrolment is with a university which complies with the entire process, including that of enrolment as prescribed by the UGC.

9.7 Teachers who acquire M.Phil. Degree or a post graduate degree in a professional course recognized by the relevant Statutory Body/Council, while in service, shall be entitled to one advance increment.

9.8 Five non-compounded advance increments shall be admissible to Assistant Librarian / College Librarian who are recruited at entry level with Ph.D. degree in the discipline of library science from a university complying with the process prescribed by the UGC in respect of enrolment, course-work and evaluation process for the award of Ph.D. in Library Science.

9.8.1 (i) Assistant Librarian / College Librarian acquiring the degree of Ph.D. at any time while in service, in the discipline of library science from a university complying with the process prescribed by the UGC in respect of enrolment, course-work and evaluation shall be entitled to 3 non-compounded advance increments.

(ii) However, persons in posts of Assistant Librarian / College Librarian or higher positions who have already been awarded Ph.D. in library science at the time of coming into force of these Regulations or having already undergone course-work as well as evaluation, if any, and only Notification in regard to the award of Ph.D. is awaited, shall also be entitled to the award of 3 non-compounded increments even if the university awarding such Ph.D. has not yet been notified by the UGC as having complied with the process prescribed by the Commission.

9.8.2 In respect of every other case of persons in the posts of Assistant Librarian / College Librarian or higher positions who are already enrolled for Ph.D. shall avail the benefit of 3 non-compounded increments only if the university awarding the Ph.D. has been notified by the UGC to have complied with the process prescribed by the Commission for the award of Ph.D. in respect of either course-work or evaluation or both, as the case may be.

9.8.3. Assistant Librarian / College Librarian and others in higher Library positions in service who have not yet enrolled for Ph. D. shall therefore derive the benefit of 3 non-compounded increments on award of Ph.D. while in service only if such

Central University of Punjab

Ref. No.

July 21, 2015

To
Registrar

Subject: Request regarding my Ph.D. increments.

I had joined centre for Genetic Diseases and Molecular Medicine on regular basis on June 18, 2013. Afterwards I submitted my Ph.D. degree for the purpose of availing the increments. Unfortunately, University of Pune had issued me duplicate copy of my degree as after registering I could not attend the convocation and failed to collect my degree within the stipulated time frame. CUPB has already communicated to University of Pune for authentication of the degree and their response is still awaited. In this process I have not been given Ph.D. increments since my joining date (more than 2 years).

I am hereby requesting that my Ph.D. increments may please be released as per university rules and if any problem arises than university reserve the right to recover the amount from me.

Sandeep Singh. 21/7/15

Sandeep Singh, AP
Officiating In-Charge
Centre for Genetic Diseases and Molecular Medicine

3485
21/7/15

21/7/15
AR (E)

Through Proper Channel

Dated. 4th March 2015

To
The Vice Chancellor
Central University of Punjab
Bathinda

Subject: Reminder- Request for Ph.D. increment

Respected Sir,

This in a reminder to the letter dated 16.2.15 for including the Ph.D. increment. I would like to inform you that I have done my Ph.D. as JRF- SRF (UGC) from 2007 to 2012 and the same was awarded in 2012. Since the Course work was not mandatory at the Mysore University and being a JRF, I was directly admitted for doing Ph.D. at Regional Institute of Education (NCERT), Mysore. Hence, I would request you to offer me five or three non- compounded advance increment of Ph.D., whichever I am eligible for.

Thanking you

Yours sincerely,

Dr. Jubilee Padmanabhan
Assistant Professor
Centre for Education,
School of Informative and Communicative Sciences,
Central University of Punjab, Bathinda.

Enclosures:

1) Joining report
2) Ph.D. certificate
3) UGC regulations

coc 5/03/2015

DAA To: ORG 7/3/2015

AR 11/3/15

Central University of Punjab

Established vide Act No. 25 (2009) of Parliament

Date: 28th April of 2015

To,

The Registrar,

CUP, Bathinda,

Re: Five Increments for Ph.D Holders

Dear Sir,

Please find this letter as a request as well as reminder to look into the matter of five increments for Ph.D holders which is past due. According to the minutes of the Executive Council of the meeting held on 9.12.2014 at 1:00 p.m. at Board Room of National Institute of Pharmaceutical Education &Research (NIPER), Mohali.

"Item No. EC:12:2014:4" in Annexure-2

"After going through the UGC Regulations 2010 (No. f.3-1/2009 dated 30.6.2010), it was unanimously **RESOLVED** that the university should follow the UGC guidelines in this regard and award the non-compounded increments as per rules contained there in."

The EC meeting took place on 9.12.2014, and its been more than four months that we haven't got any information in this regard. We again request you to release these increments in our favour. Any move in this regard will be greatly appreciated.

Thanks in anticipation.

Assistant Professors of CUP, Bathinda

(Dr. Vinod K

(Dr Pankaj

SANJEEV KUMAR,

(CHARISH CHHABRA)

Dr Preeti

128

Centre for South and Central Asian Studies

To
The Vice Chancellor
Central University of Punjab
Bathinda

Date: 04.05.2015

Subject: Grant of five increments in salary

Sir

As per the letter no CUPB/CC/14/order/3252 dated 25.04.2014, I was granted three non-compoundable advance increments in my salary. I am applying for five increments under '*incentives for Ph.D./M.Phil. and other higher qualification to take effect from 01.09.2008.*'

I was awarded Ph.D. degree from Banaras Hindu University in year 2010 when no course work was offered in research programme in Department of Geography. But my admission in research programme, supervisor allotment and evaluation and assessment of thesis were as per the UGC norms. I would also like to bring to your kind notice that one copy of my thesis was sent to foreign university for evaluation.

My university has issued me a letter that my Ph.D. degree complies with seven of ten provisions of UGC (*minimum Standards and Procedures for Awards of M.Phil./Ph.D. Degree) Regulations, 2009*. I have attached all the relevant documents with this application.

Submitted for your kind information and necessary action.

Thanking You,

Yours Sincerely

05/05/15

Kiran K Singh
Assistant Professor
Centre for South and Central Asian Studies
School of Global Relations

Registrar/
Link up with previous file
3/5/15

Through

OReg
for na

DAA 5/5/2015

6/5

R(B)-17
6/5/15

CUPB/CCS - 2015 - 10

Date - 3rd ~~June~~ 2015 4th August 2015

To,

The Registrar,

Central University of Punjab,

Bathinda, Punjab.

Through: Proper channel

Subject: Regarding to increments in present salary following the proof of PhD with coursework.

Dear Sir,

I have recently joined as assistant Professor at the centre of chemical science, Central University of Punjab, Bathinda. I have completed my PhD degree with essential coursework's and eligible to get the necessary increments in my present salary pay structure.

So, I would be highly delighted, if you kindly do the needful to add increments in my present salary (Basic + AGP = 15600 + 6000 Rs.)

Sincerely yours

4/08/15

Rajendra

Dr. Rajendra Singh Dhayal

Assistant Professor,

Basic and Applied Science, Chemical Science,

Central University of Punjab, Bathinda.

04/08/15

(Rakesh Kumar)
OIC

कुलसचिव कार्यालय
Registrar's Office
क्र./No. 1065
दिनांक/Dated 5/8/15

CUPB/CCS-2015-11

Date 4th August, 2015.

To,

The Registrar,

Central University of Punjab,

Bathinda, Punjab.

Through: Proper channel

Subject: Regarding to increments in present salary following the proof of PhD with coursework.

Dear Sir,

I have recently joined as assistant Professor at the centre of chemical science, Central University of Punjab, Bathinda. I have completed my PhD degree with essential coursework's and eligible to get the necessary increments in my present salary pay structure.

So, I would be highly delighted, if you kindly do the needful to add increments in my present salary (Basic + AGP = 15600 + 6000 Rs.)

Sincerely yours

K. K. Haldar 4.8.2015

Krishna Kanta

Dr. Krishna Kanta Haldar

Assistant Professor,

Centre for Chemical Science, School of Basic and Applied Science,

Central University of Punjab, Bathinda.

04/08/15

(Rakesh Kumar)

CIC

5/8/15

Date: 24/07/2015

To

The Registrar,
Central University of Punjab,
Bathinda

Sub: Request to grant five non-compounded advance increments for having PhD degree at the time of joining as per UGC Regulations, 2009.

Sir,

With due respect I would like to state you that I have joined on 13/07/2015 as Assistant Professor in the Centre for Economic Studies, Central University of Punjab, Bathinda. At the time of joining I have the PhD degree awarded by Lucknow University in the year 2014 as per the UGC Regulations, 2009 (Admission through Entrance Examination, Registration through Synopsis Presentation, Coursework, Thesis Evaluation by External Examiners and Open Defense).

Therefore, I request you to grant me five non-compounded advance increments w.e.f. joining as per Section 9.1 of UGC Regulations, 2010.

Thanking you.

Yours Sincerely

Jainendra Kumar Verma

(JAINENDRA KUMAR VERMA)

Enclosures:

1. Joining Report at CUP
2. Result of PhD Entrance Test, Lucknow University
3. Coursework Certificate
4. PhD Notification
5. PhD Degree Certificate
6. Copy of the relevant page of UGC, Regulations, 2010 (Section 9.1).

Jainendra Kumar Verma

(JAINENDRA KUMAR VERMA)

Forwarded for kind consideration
30/7/15
(COE)

DAA

Fixed

30/7/15

3966
31/7/15

To
The Registrar
Central University of Punjab
Bathinda – 151001.

Date: 6 August 2015

Dear Sir,

Sub: Regarding Ph.D. increments in the salary.

Myself (Dr. Vinod Arya) has joined Central University of Punjab as Assistant Professor in the Centre for Sociology w.e.f. from 29th of July 2015 (F/N).

I have completed my integrated M.Phil./Ph.D. with one year course work from Jawaharlal Nehru University in the year 2014. Based on the above facts, I humbly request you for approval of Ph.D. increments in my salary.

Enclosures:

1. Copy of Integrated M.Phil./Ph.D. Mark sheet and Degrees with details of one year Course work.
2. Copy of Joining Notification.

Sincerely
Vinod Arya

Dr. Vinod Arya
Assistant Professor
Centre for Sociology
Central University of Punjab
Bathinda (Punjab) 151001

5076
Dt. 11/8/15

Asst Registrar

117

Dated: 19-08-2015

To

The Registrar

Central University of Punjab

Bathinda

Subject: **Request for admissible 5 non-compounded Ph.D. increments in Salary**

Dear Sir,

I wish to inform you that I joined in Centre for Mathematics and Statistics as Assistant Professor on July 13, 2015. I have acquired my PhD degree as per UGC norms with course work. So, I am admissible for 5 non-compounded increments. Kindly ask you to consider my request.

Please find the following attached documents with this application:

1) Joining letter
2) Ph.D Degree photo copy
3) Course work photo copy

Thanking you,

Yours sincerely

Sachin

Sachin Kumar
Assistant Professor & OIC
Centre for Mathematics and Statistics

Forded
RamaRao
20/8/15

21/8/XV

AR (Estt)

539
21/8/15

To,

124

The Registrar
Central University of Punjab
Bathinda, 151001

Subject: Addition of five increments for Ph.D. with Coursework

Respected Sir,

This is to say that I have awarded PhD degree (Biochemistry) with course work in year 2014 from Department of Biochemistry University of Allahabad, Allahabad.

I kindly request you to add five non compounded increments to my salary as per UGC norms.

Yours Sincerely

Dated:
19/08/2015

[signature]

Dr Shashank Kumar
Assistant Professor
Centre for Biochemistry & Microbial Sciences
Central University of Punjab

Recommended and forwarded to DAA Pl.
[signature] 19/8/15

[signature] 21/8

Fwded for AR(E)

Annexure attached:
1. Copy of PhD degree (provisional)
2. Copy of Course Work Certificate
3. Copy of appointment letter

No. F. 50-4 /2012-Desk (U)
Government of India
Ministry of Human Resource Development
Department of Higher Education
Shastri Bhawan

New Delhi, Dated the 20th Feb.,2013

To

The Registrar,
Central University of Punjab,
City campus,
Mansa Road,
Bathinda.

Subject: Central University of Punjab – Ordinances-Regarding.

Sir,

I am directed to refer to letter no. CUPB/CC/VC/12/1513 dated 11.05.2012 on the subject mentioned above and to say that the ordinances no. VIII-XX, XXII, XXVI, XXVII and XX(i)- (VI) of the university have been noted by the Govt.

As regard to other ordinances no. II-VII, XXI, XXIII-XXV, a copy of the UGC's letter dated 11.01.2013 in the matter is enclosed for compliance. As regard to ordinances XXVIII-XXXI, these cannot be considered at this stage. As regard to ordinance no. I, university may include school of studies in statues instead of in ordinance –I. Center can be included in ordinance.

Yours faithfully,

(R.P. Tewari)
Under Secretary to the Government of India

Encl: As above

Copy to Secretary UGC, New Delhi with reference to letter no. 41-2/2009 (CU) dated 11.01.2013 with request to frame regulation in respect of ordinance no. XXVIII-XXXI on priority.

(R.P. Tewari)
Under Secretary to the Government of India

[illegible]
UGC website- www.ugc.ac.in

All communications should be addressed to the Secretary by designation and not by name

ज्ञान–विज्ञान विमुक्तये

UNIVERSITY GRANTS COMMISSION
BAHADURSHAH ZAFAR MARG
NEW DELHI 110002

विश्वविद्यालय अनुदान आयोग
बहादुरशाह ज़फर मार्ग
नई दिल्ली – 110 002

F.No.41-2/2009 (CU) January, 2013

11 JAN 2013

Shri R. P. Tewari
Under Secretary
Ministry of Human Resource Development,
Department of Higher Education,
Shastri Bhawan,
New Delhi – 110 001

Sub: Central University of Punjab- Ordinances - regarding.

Sir,

With reference to your letter No.F.50-4/2012- Desk (U) dated 22.5.2012 on the subject mentioned above, I am directed to send the views of the UGC on the proposed ordinance on the Central University of Punjab as per details below:-

Ordinance No.	Name of Ordinance	UGC Comments / Views
I.	Schools of Studies and Centres	UGC has no objection, subject to the condition that University may obtain the prior approval of UGC for opening/establishment of new School/Department/Centre.
II.	Emoluments, Terms and Conditions of Service of the Vice-Chancellor	(i) The clause 3.2 should be deleted.
III.	Emoluments, Terms and Conditions of Service of the Pro Vice-Chancellor	The clause 3.2 may be deleted.
IV.	Emoluments, Terms and Conditions of Service of the Registrar	The clause 3.1. of this ordinance should be replaced as under:- "The Registrar shall be entitled to unfurnished residential accommodation for which he/she shall pay prescribed license fee. The clause 3.2 of this ordinance should be deleted.
V.	Emoluments, Terms and Conditions of Service of the Finance Officer	The clause 3.1 of this ordinance should be replaced as under:- "The Finance Officer shall be entitled to unfurnished residential accommodation for which he/she shall pay prescribed license fee. The clause 3.2 of this ordinance should be deleted.
VI.	Emoluments, Terms and Conditions of the Controller of Examinations	The clause 3.1 of this ordinance should be replaced as under:- "The Controller of Examination shall be entitled to unfurnished residential accommodation for which he/she shall pay prescribed license fee

Sr. No.	Name of Ordinance	Comments / Views
VII.	Emoluments, Terms and Conditions of Service of the Librarian	The clause 3.3 of this ordinance should be deleted.
VIII.	Board of Research	UGC has no objection on this ordinance.
IX.	Admission of Students to the University	UGC has no objection on this ordinance.
X.	School Board	UGC has no objection on this ordinance.
XI.	Boards of Studies	UGC has no objection on this ordinance.
XII.	Centres of Studies in the School	UGC has no objection on this ordinance.
XIII.	Coordinators of Centres	UGC has no objection on this ordinance.
XIV.	Deans of the Schools of Studies	UGC has no objection on this ordinance.
XV.	The Dean's Committee	UGC has no objection on this ordinance.
XVI	Dean Students Welfare	UGC has no objection on this ordinance.
XVII.	Medium of Instruction and Examination	UGC has no objection on this ordinance.
XVIII.	Conduct of Examinations	UGC has no objection on this ordinance.
XIX.	Fees and Dues Payable by Students of the University	UGC has no objection on this ordinance.
XX.	M.Phil – Ph.D. Integrated Programme	UGC has no objection on this ordinance.
XXI.	Procedure / Norms for Appointment to the Faculty Positions	Clause 13 of this ordinance should be deleted.
XXII.	Terms and Conditions of Appointment of Emeritus Professors and Honorary Professors	UGC has no objection on this ordinance as prescribed by University.
XXIII.	Selection Committee for Faculty Positions	The Selection Committee for faculty positions is not in accordance with the UGC Regulation, 2010. Therefore, University may be advised to frame the ordinance on Selection Committee for faculty positions as per UGC Regulation, 2010.
XXIV.	Adjunct Professor	University may be advised to frame this ordinance as per guidelines framed by UGC for Adjunct Professor.
XXV.	Procedure / Norms for Appointment and Emoluments of Non-Teaching Employees Except for Statutory Posts	The clause 5 of this ordinance should be deleted as the GPF – cum-Pension scheme is not applicable for newly established Central Universities. In the clause 7 and 8, it should be indicated that it will be available as per rules prescribed by Government of India.
XXVI.	Planning Board	UGC has no objection on this ordinance.
XXVII.	Finance Committee	UGC has no objection on this ordinance.
XXVIII.	Selection Committee for Registrar	As per MHRD letter No.F.52-3/2011-Desk (U) dated 19th August, 2011 (copy enclosed) it was informed as under:- "The Selection Committee for the post of Professor, Associate and Assistant Professor, Registrar, Finance Officer, Controller of Examinations, Librarian and Principal of Colleges or Institution maintained by the University shall be constituted as per the extant UGC regulation for the subject"

Ordinance No	Name of Ordinance	UGC Comments / Views
XXX)		As the Regulation for the post of Registrar, Finance Officer and Controller of Examination has not been framed by UGC so far, therefore, the amendment for the post of these posts cannot be considered at this stage.
XXXI.	Selection Committee for Librarian	The Selection Committee for the post of Librarian is not in accordance with the UGC Regulation, 2010. Therefore, University may be advised to frame the Selection Committee for the post of Librarian as per UGC Regulation, 2010.

Ordinance No.	Name of Ordinance	UGC Comments / Views
XX-(i)	Ph.D. Programme	UGC has no objection on the proposed amendment.
XX-(ii)	LL.M – Ph.D Integrated Programme	
XX-(iii)	M.Pharma.-Ph.D. Integrated Programme	
XX-(iv)	M.Phil Programme	
XX-(v)	M.Tech. Programme	UGC has no objection on this ordinance.
XX-(vi)	M.A./M.Sc. Programme	UGC has no objection on this ordinance.

Encl: As above

Yours faithfully,

(Ritu Oberoi)
Under Secretary

ORDINANCE-II
[Act Section 28(1) (o); Statute 2(6)]

EMOLUMENTS, TERMS AND CONDITIONS OF SERVICE OF THE VICE CHANCELLOR

1. **Salary:** The Vice Chancellor shall receive salary and allowances as follows:

1.1 **Pay:** As notified by the Central Government from time to time.

1.2 **Dearness and Other Allowances:** As notified by the Central Government from time to time.

1.3 The Vice Chancellor shall be entitled to such terminal benefits and allowances as notified by the Central Government from time to time.

1.4 The Vice Chancellor shall be entitled to avail Leave Travel Concession, as per Central Government rules.

1.5 The Vice Chancellor shall be entitled to the reimbursement of medical expenses incurred on the medical treatment of himself/herself and his/her family members obtained for the Private OPD/Private Wards of any Govt. or Private Hospital/Nursing Home.

1.6 The Vice Chancellor shall be entitled to the reimbursement of the expenses on account of T.A. and D.A. for himself/herself and his/her family members and expenses towards shifting of household luggage from his/her home town to Bathinda and back on his/her assuming office and relinquishing it on the expiry of his/her tenure.

1.7 The Vice Chancellor shall be entitled to receive Traveling Allowance at the rates fixed by the Executive Council.

2. **Other Terms and Conditions**

2.1 The Vice Chancellor shall, during the tenure of his/her office, be entitled to 'Leave on Full Pay' at the rate of 30 days in the calendar year. The Leave shall be credited to his/her account in advance in two half yearly installments of 15 days each on the first day of January and the first day of July every year respectively.

Provided that if the Vice Chancellor assumes or relinquishes the charge of the office of the Vice Chancellor during the currency of half year, the leave shall be credited proportionately at the rate of 2½ days for each completed month of service.

2.2 The leave at the credit of the Vice Chancellor at the close of the previous half year shall be carried forward to the new half year and credited to his/her account.

2.3 The Vice Chancellor, on relinquishing the charge of his/her office, shall be entitled to receive a sum equivalent of the Leave Salary admissible for the number of days of Leave on Full Pay due to him/her at the time of his/her relinquishing of charge.

2.4 The Vice Chancellor shall also be entitled to Half Pay Leave at the rate of 20 days for each completed year of service. The Half-Pay Leave may also be availed of as commuted Leave on production of Medical Certificate.

Provided that when such commuted leave is availed of, twice the amount of Half-Pay Leave shall be debited against the Half-Pay Leave due.

2.5 The Vice Chancellor shall also be entitled to avail himself/herself of Extra-Ordinary Leave without pay for a maximum period of three months during the full term of five years on medical grounds or otherwise.

2.6 In case the Vice Chancellor is appointed for a further term or a part thereof, the leave period mentioned above, shall apply separately to each term/period.

2.7 During the period of such leave, the Vice Chancellor shall be entitled to the same salary and allowances and such other facilities of services as may have been provided.

2.8 In the case of any absence of the Vice Chancellor occasioned by any call by the Central or State Government, Public Service, or on Deputation on behalf of the University in public interest, the period so spent shall be treated as on duty.

2.9 Where an employee of the University is appointed as the Vice Chancellor, he/she shall be allowed to avail himself/herself of any leave to his/her credit before his/her appointment as the Vice Chancellor. Similarly, on his/her relinquishing the post of the Vice Chancellor and in event of his/her re-joining his/her old post, he/she shall be entitled to carry back the leave at his/her credit to the new post.

2.10 Further, he/she may be allowed to contribute to any provident fund or pension scheme of which he/she is a member and the University shall contribute to the account of such person in that provident fund or pension scheme at the same rate at which the person had been contributing immediately before his/her appointment as Vice Chancellor.

2.11 If a person, employed in another Institution, is appointed as Vice Chancellor, he/she shall be entitled to Salary, Allowances and Leave as per the rules of Central University of Punjab and Leave Salary as per the rules of parent institute. The University shall pay Leave Salary, Provident Fund, Pension Contributions, Gratuity, etc. to the parent Institution, where he/she is permanently employed.

3. Amenities

3.1 The Vice Chancellor shall be entitled to use a furnished residence, without payment of rent, throughout his term of office and no charge shall fall on the Vice-Chancellor in respect of the maintenance of such residence.

3.2 ~~The Vice Chancellor shall be entitled to such other facilities as may be decided by the university~~. Needs to be deleted as per letter No. 50-4/2012-Desk(U) of MHRD

4. Powers and Functions

The Vice Chancellor as the Chief Executive and Academic Head of the University shall have the powers to:

4.1 Ensure that the provisions of the Act, Statutes, Ordinances and Regulations are fully observed;

4.2 Delegate his powers for day-to-day work to the Pro Vice Chancellor(s), Deans, Coordinators of the Centres, Directors and other officers/Professors who should act on the basis of clear rules laid down in this regard;

4.3 Create temporary posts and in the case the post created for a period of six months or more, report it to the Executive Council;

4.4 Make appointments of Deans, Coordinators, Dean of Students Welfare, Directors, Provosts and Wardens etc;

4.5 Recommend the names for the position of Pro Vice Chancellor to the Executive Council;

4.6 Suspend action on any decision of any authority, if he/she is of the opinion that it is ultra vires of the provisions of the Act or Statues or Ordinances or that such a decision is not in the best interests of the University;

4.7 Suspend a member from the meeting of the authority, body or committee for persisting to obstruct or stall the proceedings or for indulging in behaviour unbecoming of a member; and

4.8 Suspend an employee and initiate disciplinary action against him/her. However, the Vice Chancellor may delegate these powers to other officers.

ORDINANCE-III

EMOLUMENTS, TERMS AND CONDITIONS OF SERVICE OF THE PRO VICE CHANCELLOR

[Act Section 28(1) (o); Statute 4(3)]

1. **Salary:** The Pro Vice Chancellor shall receive salary and allowances as follows:

   1.1 **Pay:** As notified by the Central Government from time to time.

   1.2 **Dearness and Other Allowances:** As notified by the Central Government from time to time.

   1.3 The Pro Vice Chancellor shall be entitled to such terminal benefits and allowances as notified by the Central Government from time to time.

   1.4 The Pro Vice Chancellor shall be entitled to avail Leave Travel Concession, as approved by the Executive Council from time to time.

   1.5 The Pro Vice Chancellor shall be entitled to the reimbursement of medical expenses incurred on the medical treatment of himself/ herself and his/her family members obtained for the Private OPD/Private Wards of any Govt. or Private Hospital/Nursing Home.

   1.6 The Pro Vice Chancellor shall be entitled to the reimbursement of the expenses on account of T.A. and D.A. for himself/herself and his/her family members and expenses towards shifting of household luggage from home town to Bathinda and back on his/her assuming office and relinquishing it on the expiry of his/her tenure.

   1.7 The Pro Vice Chancellor shall be entitled to receive Traveling Allowance at the rates fixed by the Executive Council.

2. **Other Terms and Conditions**

   2.1 The Pro Vice Chancellor shall, during the tenure of his/her office, be entitled to 'Leave on Full Pay' at the rate of 30 days in the calendar year. The leave shall be credited to his/her account in advance in two half yearly installments of 15 days each on the first day of January and the first day of July every year respectively.

   Provided that if the Pro Vice Chancellor assumes or relinquishes the charge of the office of the Pro Vice Chancellor during the currency of half year, the leave shall be credited proportionately at the rate of 2½ days for each completed month of service.

   2.2 The leave at the credit of the Pro Vice Chancellor at the close of the previous half year shall be carried forward to the new half year and credited to his/her account.

   2.3 The Pro Vice Chancellor, on relinquishing the charge of his/her office, shall be entitled to receive a sum equivalent of the Leave Salary admissible for the number of days of Leave on Full Pay due to him/her at the time of his/her relinquishing of charge.

2.4 The Pro Vice Chancellor shall also be entitled to Half Pay Leave at the rate of 20 days for each completed year of service. The Half-Pay Leave may also be availed of as commuted Leave on production of Medical Certificate.

Provided that when such commuted leave is availed of, twice the amount of Half-Pay Leave shall be debited against the Half-Pay Leave due.

2.5 The Pro Vice Chancellor shall also be entitled to avail himself/herself of Extra-Ordinary Leave without pay for a maximum period of three months during the full term of five years on medical grounds or otherwise.

2.6 In case the Pro Vice Chancellor is appointed for a further term or a part thereof, the leave period mentioned above, shall apply separately to each term/period.

2.7 During the period of such leave, the Pro Vice Chancellor shall be entitled to the same salary, and allowances and such other facilities of services as may have been provided.

2.8 In the case of any absence of the Pro Vice Chancellor occasioned by any call by the Central or State Government, Public Service, or on Deputation on behalf of the University for any public purpose, the period so spent shall be treated as on duty.

2.9 Where an employee of the University is appointed as the Pro Vice Chancellor, he/she shall be allowed to avail himself/herself of any leave at his/her credit before his/her appointment as the Pro Vice Chancellor. Similarly, on his/her relinquishing the post of the Pro Vice Chancellor and in event of his/her re-joining his/her old post, he/she shall be entitled to carry back the leave at his/her credit to the new post.

2.10 Further, he/she may be allowed to contribute to any provident fund or pension scheme of which he/she is a member and the University shall contribute to the account of such person in that provident fund or pension scheme at the same rate at which the person had been contributing immediately before his/her appointment as Pro Vice Chancellor.

2.11 If a person, employed in another Institution, is appointed the Pro Vice Chancellor, he/she shall be entitled to Salary, Allowances, Leave and Leave Salary as per the rules of the Central University of Punjab. The University shall also pay Leave Salary, Provident Fund, and Pension Contributions to the parent Institution, where he/she permanently employed.

3. Amenities

3.1 The Pro Vice Chancellor shall be entitled to free, semi-furnished residential accommodation. The premises of his/her lodging will be maintained by the University.

3.2 ~~The Pro Vice Chancellor shall be entitled to such other facilities as may be decided by the university~~. Needs to be deleted as per letter No. 50-4/2012-Desk(U) of MHRD

4. Powers And Functions

The Pro Vice Chancellor shall assist the Vice Chancellor in respect of such matters as may be specified by the Vice Chancellor in this behalf, from time to time, and shall also exercise such powers and perform such duties as may be delegated or assigned to him/her by the Vice Chancellor.

ORDINANCE-IV

EMOLUMENTS, TERMS AND CONDITIONS OF SERVICE OF THE REGISTRAR

[Act Section 28(1) (o); Statute 6(3)]

1. **Salary:** The Registrar shall receive salary and other allowances as prescribed by the University.

2. **Other Terms and Conditions**

2.1 The Registrar shall be a whole-time salaried officer of the University.

2.2 He/she shall be appointed by the Executive Council on the recommendation of a Selection Committee constituted for the purpose for a term of five years and shall be eligible for re-appointment.

Provided that the Registrar shall retire on attaining the age of sixty-two years.

2.3 The emoluments and other terms and conditions of service of the Registrar shall be such as may be prescribed by the Executive Council from time to time.

2.4 When the office of the Registrar is vacant or when the Registrar is, by reason of illness, absence or any other cause, unable to perform the duties of his office, the duties of the office shall be performed by such person as the Vice Chancellor may appoint for the purpose.

2.5 If the services of the Registrar are borrowed from Government or any other Organization/Institution, the terms and conditions of his/her service shall be governed by the Deputation Rules of the University.

Provided that a Registrar on deputation may be repatriated earlier than the stipulated period by the Executive Council on the recommendations of the Vice Chancellor.

2.6 The Registrar shall be entitled to such Leave, Allowances, Provident Fund, and other terminal benefits as prescribed by the University from time to time for its non-vacational staff.

3. **Amenities**

3.1 ~~The Registrar shall be entitled to free unfurnished residential accommodation~~. Needs to be replaced as per letter No. 50-4/2012-Desk(U) of MHRD, as:

"3.1 The Registrar shall be entitled to unfurnished residential accommodation for which he/she shall pay prescribed license fee."

3.2 ~~The Registrar shall be entitled to such other facilities as may be decided by the university~~. Needs to be deleted as per letter No. 50-4/2012-Desk(U) of MHRD

4. Powers and Functions

4.1 The Registrar shall have the power to take disciplinary action against such of the employees, excluding teachers and other academic staff, as may be specified in the order of the Executive Council and to suspend them pending inquiry, to administer warnings to them or to impose on them the penalty of censure or the withholding of increment. Provided that

4.1.1 such disciplinary action will not be taken without obtaining the prior approval of the Vice Chancellor.

4.1.2 no such penalty shall be imposed unless the person has been given a reasonable opportunity of showing cause against the action proposed to be taken against him.

4.1.3 an appeal shall lie to the Vice Chancellor against any order of the Registrar imposing any of the penalties specified in clause 11.1.

4.1.4 in a case where the inquiry discloses that a punishment beyond the power of the Registrar is called for, the Registrar shall, upon the conclusion of the inquiry, make a report to the Vice-Chancellor along with his recommendations:

Provided that an appeal shall lie to the Executive Council against an order of the Vice Chancellor imposing any penalty.

4.2 The Registrar shall be *ex officio* Secretary of the Executive Council and the Academic Council, but shall not be deemed to be a member of either of these authorities. He shall be *ex officio* Member-Secretary of the Court.

4.3 It shall be the duty of the Registrar to:

4.3.1 Be the custodian of the records, the common seal and such other property of the University as the Executive Council shall commit to his charge;

4.3.2 Issue all notices convening meetings of the Court, the Executive Council, the Academic Council and of any Committees appointed by those authorities;

4.3.3 Keep the minutes of all the meetings of the Court, the Executive Council, the Academic Council and of any Committees appointed by those authorities;

4.3.4 Conduct the official correspondence of the Court, the Executive Council and the Academic Council;

4.3.5 Supply to the Visitor, copies of the agenda of the meetings of the authorities of the University as soon as they are issued and the minutes of such meetings;

4.3.6 Represent the University in suits or proceedings by or against the University, sign powers of attorney and verify pleadings or depute his representative for the purpose; and

4.3.7 Perform such other duties as may be specified in the Statutes, the Ordinances or the Regulations or as may be required from time to time by the Vice-Chancellor.

4.4 The Registrar shall assist the Vice Chancellor in respect of such matters as may be specified by the Vice Chancellor in this behalf, from time to time, and shall also exercise such powers and perform such duties as may be assigned or delegated to him/her by the Vice Chancellor.

ORDINANCE-V

EMOLUMENTS, TERMS AND CONDITIONS OF SERVICE OF THE FINANCE OFFICER
(Act Section 28(1)(o); Statute 7(3))

1. **Salary:** The Finance Officer shall receive salary and other allowances as prescribed by the University.

2. **Other Terms and Conditions**

2.1 The Finance Officer shall be a whole-time salaried officer of the University.

2.2 He/she shall be appointed by the Executive Council on the recommendation of a Selection Committee constituted for the purpose for a term of five years and shall be eligible for re-appointment.

Provided that the Finance Officer shall retire on attaining the age of sixty-two years.

2.3 The emoluments and other terms and conditions of service of the Finance Officer shall be such as may be prescribed by the Executive Council from time to time.

2.4 When the office of the Finance Officer is vacant or when the Finance Officer is, by reason of illness, absence or any other cause, unable to perform the duties of his/her office, the duties of the office shall be performed by such person as the Vice Chancellor may appoint for the purpose.

2.5 If the services of the Finance Officer are borrowed from Government or any other Organization/Institution, the terms and conditions of his/her service shall be governed by the Deputation Rules of the University.

Provided that a Finance Officer on deputation may be repatriated earlier than the stipulated period by the Executive Council on the recommendations of the Vice Chancellor.

2.6 The Finance Officer shall be entitled to such Leave, Allowances, Provident Fund, and other terminal benefits as prescribed by the University from time to time for its non-vacational staff.

3. Amenities

3.1 ~~The Finance Officer shall be entitled to free unfurnished residential accommodation.~~ Needs to be replaced as per letter No. 50-4/2012-Desk(U) of MHRD, as:

"3.1 The Finance Officer shall be entitled to unfurnished residential accommodation for which he/she shall pay prescribed license fee."

3.2 ~~The Finance Officer shall be entitled to such other facilities as may be decided by the~~

~~university~~. Needs to be deleted as per letter No. 50-4/2012-Desk(U) of MHRD

4. Powers and Functions

The Finance Officer shall be *ex officio* Secretary of the Finance Committee, but shall not be deemed to be a member of such Committee.

4.1 It shall be the duty of the Finance Officer to:

4.1.1 Exercise general supervision over the funds of the University and shall advise it as regards its financial policy; and

4.1.2 Perform such other financial functions as may be assigned to him/her by the Executive Council or the Vice Chancellor or as prescribed by the Statutes, the Ordinances or the Regulations.

4.1.3 Subject to the control of the Executive Council, the Finance Officer shall-

a. hold and manage the property and investments of the University including trust and endowed property;

b. ensure that the limits fixed by the Executive Council for recurring and nonrecurring expenditure for a year are not exceeded and that all moneys are expended on the purpose for which they are granted or allocated;

c. be responsible for the preparation of annual accounts, balance sheet and the budget of the University and for their presentation to the Executive Council;

d. keep a constant watch on the state of the cash and bank balances and on the state of investments;

e. watch the progress of the collection of revenue and advise on the methods of collection employed;

f. ensure that the registers of buildings, land, furniture and equipment are maintained up-to-date and that stock-checking is conducted, of equipment and other consumable materials in all offices, Centres and Specialized Laboratories;

g. bring to the notice of the Vice Chancellor unauthorised expenditure and other financial irregularities and suggest disciplinary action against persons at fault; and

h. call from any office, Centre, Laboratory or Institution maintained by the University any information or returns that he/she may consider necessary for the performance of his/her duties.

a. Any receipt given by the Finance Office or the person or persons duly authorized in this behalf by the Executive Council for any money payable to the University shall be sufficient discharge for payment of such money.

b. The Finance Officer shall assist the Vice Chancellor in respect of such matters as may be specified by the Vice Chancellor in this behalf, from time to time, and shall also exercise such powers and perform such duties as may be assigned or delegated to him/her by the Vice Chancellor.

ORDINANCE-VI

EMOLUMENTS, TERMS AND CONDITIONS OF SERVICE OF THE CONTROLLER OF EXAMINATIONS

[Act Section 28(1) (o); Statute 8(3)]

1. **Salary:** The Controller of Examinations shall receive salary and other allowances as prescribed by University.

2. **Other Terms and Conditions**

2.1 The Controller of Examination shall be a whole-time salaried officer of the University.

2.2 He/she shall be appointed by the Executive Council on the recommendation of a Selection Committee constituted for the purpose for a term of five years and shall be eligible for re-appointment.

Provided that the Controller of Examination shall retire on attaining the age of sixty-two years.

2.3 The emoluments and other terms and conditions of service of the Controller of Examinations shall be such as prescribed by the Executive Council from time to time.

2.4 When the office of the Controller of Examinations is vacant or when the Controller of Examinations is, by reason of illness, absence or any other cause, unable to perform the duties of his office, the duties of the office shall be performed by such person as the Vice Chancellor may appoint for the purpose.

2.5 If the services of the Controller of Examinations are borrowed from Government or any other organization/ Institution, the terms and conditions of his/her service shall be governed by the Deputation Rules of the University.

Provided that a Controller of Examinations on deputation may be repatriated earlier than the stipulated period by the Executive Council on the recommendations of the Vice Chancellor.

2.6 The Controller of Examinations shall be entitled to such Leave, Allowances, Provident Fund, and other terminal benefits as prescribed by the University from time to time for its non-vacational staff.

3. Amenities

3.1 ~~The Controller of Examinations shall be entitled to free unfurnished residential accommodation~~. Needs to be replaced as per letter No. 50-4/2012-Desk(U) of MHRD, as:

"3.1 The Controller of Examinations shall be entitled to unfurnished residential accommodation for which he/she shall pay prescribed license fee."

3.2 ~~The Controller of Examinations shall be entitled to such other facilities as may be decided by the university~~. Needs to be deleted as per letter No. 50-4/2012-Desk(U) of MHRD

4 Powers and Functions

The Controller of Examinations shall arrange for and superintend the examinations of the University in the manner prescribed by the Ordinances or the Regulations or as may be required from time to time by the Vice Chancellor.

ORDINANCE-VII

EMOLUMENTS, TERMS AND CONDITIONS OF SERVICE OF THE LIBRARIAN
[Act Section 17, 28(1) (o); Statute 9]

1. **Salary:** The Librarian shall receive salary and other allowances as prescribed by the University.

2. **Other Terms and Conditions**

2.1 The Librarian shall be a whole-time salaried officer of the University.

2.2 He/she shall be appointed by the Executive Council on the recommendations of a Selection Committee constituted for the purpose.

2.3 The emoluments and other terms and conditions of the Librarian shall be such as may be prescribed by the Executive Council from time to time.

2.4 When the office of the Librarian is vacant or when the Librarian is, by reason of illness, absence or any other cause, unable to perform the duties of his/her office, the duties of the office shall be performed by such person as the Vice Chancellor may appoint for the purpose.

2.5 If the services of the Librarian are borrowed from Government or any other Organization/ Institution, the terms and conditions of his/her service shall be governed by the Deputation Rules of the University.

Provided that a Librarian on deputation may be repatriated earlier than the stipulated period by the Executive Council on the recommendations of the Vice Chancellor.

2.6 The Librarian shall be entitled to such Leave, Allowances, Provident Fund, and other terminal benefits as prescribed by the University from time to time for its non-teaching staff.

3. **Amenities**

3.1. Librarian shall be entitled to such facilities as may be decided by the university. **Needs to be deleted as per letter No. 50-4/2012-Desk(U) of MHRD**

4. **Powers and Functions**

The Librarian shall exercise such powers and perform such duties as may be assigned to him/her from time to time by the Executive Council or by the Vice Chancellor.

ORDINANCE-XXI

PROCEDURE / NORMS FOR APPOINTMENT TO THE FACULTY POSITIONS
[Act Section 26(d), 28(1)(o)]

1. Professors, Associate Professors and Assistant Professors and other equivalent academic positions as may be recommended by Academic Council shall constitute the faculty of the University.

2. The University will widely advertise the above posts and make appointments thereto on the recommendations of the Selection Committees constituted as per Statutes and relevant Ordinances.

3. The Chairperson shall be entitled to vote at the Selection Committees meeting and shall have a casting vote in the case of a tie.

4. The recommendations of the Selection Committees shall be submitted to the Executive Council for approval.

5. The minimum qualifications and other terms and conditions shall be as prescribed by the UGC /concerned Statutory Councils, and as adopted by the University from time to time.

6. The University may prescribe the desirable qualifications.

7. The prescribed qualifications and experience will be minimum, and the mere fact that a candidate possesses these, will not entitle him/her for being called for interview. The University will have the right to restrict the number of candidates to be called for interview, to a reasonable number on the basis of qualifications and experience higher than the minimum prescribed or by any other condition that it may deem fit.

8. The Executive Council as per provisions of Act may offer appointment to suitable person(s).

9. The rules and regulations as prescribed by the Government of India in respect of the reservations in academic institutions shall be followed.

10. If two or more candidates are selected, the recommendations shall invariably be made in order of merit of the selected candidates.

11. No recommendations shall be made with a condition attached to the occurrence of the future events.

12. The Selection Committee, after considering a candidate for the post of Professor or Associate Professor, may, if it is of the opinion that he/she will be a more suitable choice for the next lower post, can make such recommendation.

13. ~~The University will have the right to relax any of the qualifications, such as experience, minimum marks, age, etc. in deserving cases and it shall be ratified by the Selection Committee~~

~~and the same shall be so stated and recorded~~. Needs to be deleted as per letter No. 50-4/2012 Desk(U) of MHRD

14. The Selection Committee may recommend a higher initial pay or advance increments to a selected candidate, and give the reasons therefore.

15. Number of posts advertised may be treated as tentative. The University shall have the right to increase/decrease the number of posts at the time of selection and make appointments accordingly.

16. Canvassing in any form on behalf of any candidate will disqualify such candidate.

17. The Chairperson shall have the power to lay-down the procedure in respect of any matter not mentioned in the Act/Statutes/Ordinances.

18. When a Panel is recommended by the Selection Committee and approved by the Executive Council it shall remain valid for a period of one year.

Chapter-I

Statute

SCHOOLS OF STUDIES AND CENTRES

The University shall have for the present the following Schools of Studies and Centres but may establish such other Schools and Centres as may be required from time to time.

1. **School of Environment and Earth Sciences**
   a) Centre for Environmental Science and Technology
   b) Centre for Biosafety and Biosecurity
   c) **Centre for ~~Earth Sciences~~* Geography and Geology**
   d) Centre for Meteorological Studies
   e) Centre for Disaster Management
   f) Centre for Natural Resource Management
   g) Centre for Nanotoxicology and Nanobiosafety
   h) Centre for Alternate Energy Resources

2. **School of Social Sciences**
   a) Centre for Economic Studies
   b) **Centre for ~~Social Studies~~* Sociology**
   c) Centre for Historical Studies
   d) Centre for Social Work
   e) Centre for Rural Development
   f) Centre for Population and Gender Studies
   g) Centre for Sikh Studies

3. **School of Languages, Literature and Culture**
   a) Centre for Linguistics and Culture
   b) Centre for Comparative Literature
   c) Centre for Classical and Modern Languages **(Punjabi Language, Literature and Culture; English)***
   d) Centre for Museology, Archeology and Conservation
   e) Centre for Punjabi Language, Literature and Culture
   f) Centre for Hindi Language and Literature
   g) Centre for Endangered Languages

4. School of Basic and Applied Sciences
    a) ~~Centre for Biosciences~~^
        - **Centre for Animal Sciences**
        - **Centre for Plant Sciences**
        - **Centre for Chemical Sciences**
    b) Centre for ~~Chemical and~~ Pharmaceutical Sciences **and Natural Products***
    c) ~~Centre for Physical and Mathematical Sciences~~^
        - **Centre for Physics**
        - **Centre for Mathematics and Statistics**
    d) Centre for Waste Management
    e) Centre for Advanced Materials and Nanotechnology
    f) Centre for Food Science Technology
    g) Centre for Computational Sciences
    h) Centre for Indigenous Traditional Knowledge
    i) **Centre for Biochemistry and Microbial Sciences**

5. School of Emerging Life Sciences Technologies
    a) Centre for Stem Cells and Recombinant Technologies
    ~~b) Centre for Genetic Diseases and Molecular Medicine#~~
    c) Centre for Bioinformatics
    d) Centre for Health Sciences and Bioethics

6. School of Information and Communicative Sciences
    a) Centre for Information Dissemination Technologies
    b) Centre for Mass Communication and Media Studies
    c) Centre for Graphic Arts, Animation and Cinematic Studies

7. School of Design and Planning
    a) Centre for Green Architecture and Landscape Design
    b) Centre for Rural and Urban Built Environment
    c) Centre for Ancient and Modern Architecture
    d) Centre for Industrial and Product Design
    e) Centre for Interior Design

8. School of Global Relations
    a) Centre for Regional Conflicts and Cooperation
    b) Centre for South and Central Asian Studies
    c) Centre for Global Economy and Geopolitics
    d) Centre for International Institutions and Organizations

9. **School of Management**
    a) Centre for Corporate and Industrial Relations
    b) Centre for Financial Administration
    c) Centre for Retail and Marketing
    d) Centre for Agri-business
    e) Centre for Human Resource Management
    f) Centre for Production Management
    g) Centre for Information Technology and Management
    h) Centre for Health and Hospital Management
    i) Centre for Hospitality and Tourism
    j) Centre for Organizational Behaviour

10. **School of Engineering and Technology**
    a) Centre for Computer Science and Technology
    b) Centre for Microelectronics
    c) Centre for Biomedical Engineering
    d) Centre for Microwave Technology
    e) Centre for Thermal Imaging and Image Processing
    f) Centre for Ballistics Technology
    g) Centre for Petroleum Technology

11. **School of Legal Studies and Governance**
    a) Centre for Corporate Law
    b) Centre for International Law
    c) ~~**Centre for Environmental Law**~~* ~~**Centre for Law**~~ ** **Centre for Legal Studies and Research**
    d) Centre for Human Rights

12. **School of Health Sciences**
    a) Centre for Medical Sciences
    b) Centre for Dental Sciences
    c) Centre for AYUSH (Ayurveda, Yoga & Natural Therapy, Unani, Sidha Homoeopathy)
    d) Centre for Nursing and Physiotherapy
    e) Centre for Human Kinetics
    f) ~~**Centre for Human Genetics**~~ # **Centre for Human Genetics and Molecular Medicine**

Note: *The approval of Visitor regarding the Schools of Studies and Centers was received vide letter no. F.No.42-26/2009-Desk (U) dated 16th March 2011 from Ministry of Human Resource Development.*

As resolved by the Executive Council in its 15th meeting vide Item No.EC:15:15:12, the a bove Centres marked as symbols detailed below need to be amended

*Renamed
Merged
^ Split into more Centres
~New Centre

** Renamed; as resolved by the Executive Council vide Item No. EC:17:2015:10

Annexure 19-16

Sr.No	Name	Designation	Ofice	Date of appoitment	Date of completion of Probation
1	Mrs. Simerjit Kaur	Medical Attendant	Health Centre	27.8.2013	26.8.2015
2	Mr. Jyoti Singh	Cook	D-13, Campus Office	27.8.2013	26.8.2015
3	Mr. Nivedan Salwan	UDC	VC Office	24.9.2013	23.9.2015
4	Mr. Rohit Rastogi	UDC	Registrar Office	24.9.2013	23.9.2015
5	Mrs. Jyoti	LDC	Registrar Office	24.9.2013	23.9.2015
6	Mr. Ravinder Singh	Library Attendant	University Library	27.9.2013	26.9.2015
7	Mrs. Veerpal Kaur	Library Attendant	University Library	30.9.2013	29.9.2015
8	Mr. Harvinder Singh	LDC	Registrar Office	01.10.2013	30.9.2015
9	Mr. Ranbir Singh	Section Officer	Store & Purchase	16.9.2013	15.9.2015
1	Mr. Darshan Singh	Driver	VC'S Driver	18.10.2013	17.10.2015
2	Mr. Harvinder Singh	Office Attendant	VC Office	20.11.2013	19.11.2015
3	Mr. Devi Lal	Office Attendant	VC Office	20.11.2013	19.11.2015
4	Mr. PawanKumar	Office Attendant	DAA Office	25.11.2013	14.11.2015
5	Mrs. Shweta Arora	Deputy Registrar	Registrar Office	11.12.2013	10.12.2015
6	Mr. Bhupinder Singh	Professional Asst.	University Liberary	17.12.2013	16.12.2015
7	Mr. Rajender Kuamr	Asst. Registrar	Examinations	19.12.2013	18.12.2015
8	Mr. Gautam Sharma	Asst. Registrar	Registrar Office (Estab.)	19.12.2013	18.12.2015
9	Mr. Ravi Dutt	Laboratory Attendant	Bio Laboratory	27.12.2013	26.1.2015
10	Mrs. Anupam Sharma	LDC	Computer Centre	01.01.2014	31.12.2015
11	Mr. Sachin	LDC	Store and Purchase	01.01.2014	31.12.2015
12	Mr. Pawan Poonia	Laboratory Assistant	TISSUE Cultuer Lab	02.01.2014	01.01.2016
13	Mr. Sandeep Kumar	Assistant	Registrar Office	08.01.2014	07.01.2016
14	Mr. Subhash Chander	MTS	Estate Office	08.01.2014	07.01.2016
15	Mr. Balraj Singh	Driver	VC's Driver	08.01.2014	07.01.2016
16	Mr. Roshan Kumar	Laboratory Assistant	GDMM Lab.	17.01.2014	16.01.2016

Annexure 19.1.17

Sr.No	Name	Designation	Centre for	Date of appoitment	Date of completion of Probation
1	Dr. Amandeep Singh	Asst. Prof.	Comparative Literature	25.3.2013	24.3.2015
2	Dr. Puneeta Pandey	Asst. Prof.	Environmental Science and Technology	25.3.2013	24.3.2015
3	Dr. Kiran K. Singh	Asst. Prof.	Geoprahy and Geology	25.3.2013	24.3.2015
4	Dr. Bawa Singh	Asst. Prof.	South and Central Asian Studies	01.4.2013	31.3.2015
5	Er. Surinder Singh Khurana	Asst. Prof.	Computer Science and Technology	16.4.2013	15.4.2015
6	Dr. Deepak Kumar	Asst. Prof.	Law	25.4.2013	24.4.2015
7	Dr. Puneet Pathak	Asst. Prof.	Law	26.4.2013	25.4.2015
8	Dr. Achchhe Lal Sharma	Asst. Prof.	Physical Sciences	01.5.2013	30.4.2015
9	Dr. Kamlesh Yadav	Asst. Prof.	Physical Sciences	06.5.2013	06.5.2015
10	Dr. Kousik Giri	Asst. Prof.	Computational Sciences	10.5.2013	09.5.2015
11	Dr. Preeti Khetarpal	Asst. Prof.	Human Genetics and Molecular Medicine	17.6.2013	16.6.2015
12	Dr. Sandeep Singh	Asst. Prof.	Human Genetics and Molecular Medicine	18.6.2013	17.6.2015
13	Dr. Mahesh Kulharia	Asst. Prof.	Computational Sciences	05.7.2013	04.7.2015
14	Dr. Naresh Kumar Singla	Asst. Prof.	Economic Studies	10.9.2013	09.9.2015
15	Dr. Ramanpreet Kaur	Asst. Prof.	Classical and Modern Languages	20.9.2013	19.9.2015
16	Dr. Shamshir Singh Dhillon	Asst. Prof.	Education	28.11.2013	27.11.2015
17	Dr. Monisha Dhiman	Asst. Prof.	HG & MM	10.12.2013	09.12.2015
18	Dr. Pankaj Bhardwaj	Asst. Prof.	Plant Sciences	10.12.2013	09.12.2015
19	Dr. Vikas Jaitak	Asst. Prof.	Pharmaceutical Sciences and Natural Products	10.12.2013	09.12.2015
20	Dr. Nishtha Kaushiki	Asst. Prof.	SCAS	23.12.2013	22.12.2015
21	Dr. Anjana Munshi	Associate Prof.	HG & MM	06.01.2014	05.01.2016
22	Dr. Harish Chander	Asst. Prof.	HG & MM	20.01.2014	19.01.2016

Unit-II

1. Definition of agreement; Agreements and scope thereof; Prohibition on Anti-Competition Agreements; Per se and Rule of Reason.
2. Types of anti-competitive Agreements : Horizontal Agreements including cartels, Presumption in case of certain Horizontal agreements
3. Vertical Agreements
4. Procedure for Inquiry by Competition Commission of India
5. Exceptions- Joint Ventures; Intellectual Property Rights ; Export Exemption
6. Orders by Competition Commission and Penalties for Contravention
7. Leniency Programme for Cartels
8. Definition and determination of Dominance
9. Abuse of dominance – exclusionary abuses and exploitative abuses
10. Procedure for Inquiry by Competition Commission of India into abuse of Dominant position
11. Remedies against abuse of dominant position

Unit-III

1. Definition of Combinations; types of combinations including mergers, acquisitions, amalgamations, acquisition of control jurisdiction of Competition Commission of India
2. Jurisdictional Test-Turnover, Asset, domestic nexus, exemptions
3. Notification of Combination
4. Procedure for Inquiry Combinations
5. Test of Appreciable Adverse Effect
6. Remedies and Orders in case of combinations

Unit – IV

1. Objectives and advantages of Competition Compliance Programme
2. Components of Competition Compliance Programme for Enterprises
3. Compliance Programme for trade associations
4. General Guidelines for Devising a compliance Programme
5. Competition compliance Programmes in UK,USA and European Union
6. Implementation of compliance Programme-Training, Monitoring and Evaluation

Suggested Readings

1. Ramappa, T. (2006).*Competition Law in India: Policies, Issues and Development*, Oxford University Press, New Delhi, .
2. Dhall, Vinod (ed.).(2007) Competition Law Today: Concepts, Issues and the Law in Practice, Oxford University Press.
3. Roy, Abir and Kumar, Jayant.(2008) Competition Law in India, Eastern Law House, Kolkata, New Delhi.

4. Mehta, Pradeep S.(2006). *A Functional Competition Policy for India,* CUTS International, Academic Foundation, New Delhi.
5. Saharay, H.K.(2012). *Textbook on Competition Law.* Universal Law Publishing Co. Pvt. Ltd., New Delhi.
6. Agrawal. V.K.(2011). Competition Act, 2002 (Principles and Practices), Bharat Law House Pvt. Ltd., New Delhi.
7. Furse, Mark. (2004).*Competition Law of the EC and UK*, Oxford University Press, Oxford.
8. Mittal, D.P., (2003).*Competition Law*, Taxmann, New Delhi.
9. Whish, Richard(2009). *Competition Law*, 6th Ed., Oxford University Press, Oxford.

CENTRAL UNIVERSITY OF PUNJAB, BATHINDA-151001

School of Legal Studies and Governance

Centre for Law

LL.M. Two Years Programme

SEMESTER I

SN	Paper Code	Classification of Paper	Course Title	L	T	P	Cr	% Weightage				E
								A	B	C	D	
1	LSR.501	Core	Research Methodology & Legal Writing	5	-	-	5	25	25	25	25	100
2	LSR.502	Foundation	Computer Applications	3	-	-	3	25	25	25	25	100
3	LSR.503	Core	Law and Social Transformation in India	4	-	-	4	25	25	25	25	100
4	LSR.504	Foundation	Legal Theory	4	-	-	4	25	25	25	25	100
5	LSR.505	Foundation	Applied Legal Studies – I	5	-	-	5	25	25	25	25	100
6	LSR.506	Foundation	Computer Applications-P	-	-	2	2	-	-	-	-	50
7	XXX.000	Elective	Inter-Disciplinary - I (From any other Centre)	2	-	-	2	10	15	15	10	50
				23	-	2	25					600

Inter Disciplinary Papers/Elective Papers (Offered by the Centre)

SN	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
i.	LSR.507	General Legal Awareness	2	-	-	2	10	15	15	10	50
ii.	LSR.508	International Env Law	2	-	-	2	10	15	15	10	50
iii.	LSR.509	Consumer Protection Law.	2	-	-	2	10	15	15	10	50
iv.	LSR.510	Women and Law	2	-	-	2	10	15	15	10	50
v.	LSR.511	Introduction to the Law on Children in India	2	-	-	2	10	15	15	10	50
vi.	LSR 512	Fundamentals of Criminal Law	2	-	-	2	10	15	15	10	50
			2	-	-	2					50

A: Continuous Assessment: Based on Objective Type Tests
B: Mid-Term Test-1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

SEMESTER II

SN	Paper Code	Classification of Paper	Course Title	L	T	P	Cr	% Weightage				E
								A	B	C	D	
1	LSR.551	Core	Judicial Process	4	-	-	4	25	25	25	25	100
2	LSR.552	Core	Indian Constitution and New Challenges	4	-	-	4	25	25	25	25	100
3	LSR.553	Core	Comparative Public Law and Governance	4	-	-	4	25	25	25	25	100
4	LSR.554	Foundation	Principles of Legislation and Interpretation	4	-	-	4	25	25	25	25	100
5	LSR.555	Foundation	Applied Legal Studies – II	5	-	-	5	25	25	25	25	100
6	LSR.556	Core	Seminar	-	-	2	1	-	-	-	-	50
7	XXX.000	Elective	Inter-Disciplinary II (From any Other Centre)	2	-	-	2	10	15	15	10	50
				23	-	**2**	**25**					**600**

Inter-Disciplinary/Elective Papers Paper-II: (Offered by the Centre)

SN	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
i.	LSR.557	Environmental Law and Governance	2	-	-	2	10	15	15	10	50
ii.	LSR.558	Human Rights and Governance	2	-	-	2	10	15	15	10	50
iii.	LSR.559	Corporate Governance and Practices	2	-	-	2	10	15	15	10	50
iv.	LSR.560	Intellectual Property Laws	2	-	-	2	10	15	15	10	50
v.	LSR.561	Ethics in Research	2	-	-	2	10	15	15	10	50
			2	-	-	2					50

SEMESTER III

SN	Paper Code	Classification of Paper	Course Title	L	T	P	Cr	% Weightage				E
								A	B	C	D	
1	EVL/HRL /CP/FAL/ IPR.601	Elective	Group paper- I	4	-	-	4	25	25	25	25	100
2	EVL/HRL /CP/FAL/ IPR.602	Elective	Group paper- II	4	-	-	4	25	25	25	25	100
3	EVL/HRL /CP/FAL/ IPR.603	Elective	Group paper- III	4	-	-	4	25	25	25	25	100
4	LSR.649	Core Course	Seminar and Synopsis approval etc.	-	-	-	10	-	-	-	-	200
				12	**-**	**-**	**22**	-	-	-	-	**500**

Note: For LSR.649, A committee of three members (Dean/Nominee, COC/Nominee and the Supervisor) will evaluate the progress report and average of these marks will be awarded.

SEMESTER IV

SN	Paper Code	Classification of Paper	Course Title	L	T	P	Cr	% Weightage				E
								A	B	C	D	
1	EVL/HRL/CP/FAL/ IPR.651	Elective	Group paper- IV	4	-	-	4	25	25	25	25	100
2	EVL/HRL/CP/FAL/ IPR.652	Elective	Group paper- V	4	-	-	4	25	25	25	25	100
3	LSR.699	Core Course	Dissertation	-	-	-	14					400
				12	**-**	**-**	**22**					**600**

Note: For LSR.699, the Dissertation will be evaluated as per CUPB norms.

Group Details (In reference to optional papers in Semester III and IV):

Group	Semester III (Code and Names of the Papers)	Semester IV (Code and Names of the Papers)
Group I	**EVL.601:** Historical, Philosophical and Theoretical Foundation of Environment Protection **EVL. 602:** Environment Law & Policy-International Development **EVL 603:** Environment Protection and Sustainable Development	**EVL.651**: Emerging Paradigms of Legal Framework on Environmental Management in India **EVL.652:** Role of Judiciary, NGOs in Environmental Protection
Group II	**HRL.601**: International Human Rights Law **HRL.602**: Protection & Enforcement of Human Rights in India **HRL.603:** Human Rights of Vulnerable and Disadvantaged Groups	**HRL.651:** Criminal Justice System and Human Rights **HRL.652:** Refugees and Humanitarian Law
Group III	**CPL.601:** Corporate Law and Governance, **CPL.602:** Competition and Consumer Protection Law **CPL.603:** Regulation of Capital Market and Foreign Investment	**CPL.651:** Banking and Insurance Law, **CPL.652:** Law of Corporate Finance and Securities Regulations
GROUP IV	**FAL 601**: Law of Marriage **FAL 602:** Law of Matrimonial Relief **FAL 603:** Law of Adoption and Maintenance	**FAL 651**: Law of Succession **FAL 652:** Practice and Procedure in Family Law
GROUP V	**IPR 601**: General Regime of Intellectual Property Law **IPR 602**:Law of Copyright and related Rights **IPR 603**: Law of Patents, Trade Secrets and Related Rights	**IPR 604**: Law of Trademarks, Designs and Unfair Competition **IPR 605**:Law of Industrial Design, Geographical Indications and Layout Designs of Integrated Circuits

Note: 1. **The student will not be permitted to change the group once they give their option.**

2. Total marks of practical will include 20% weightage of Continuous Assessment and 80% end semester exam including Notebook / Viva / Performance/ written test.

Instructions for candidates

- The end-semester examination will have a weightage of 25%. The question paper for end-semester examination will consist of 100 objective questions of equal marks. All questions will be compulsory.
- Two pre-announced test will be conducted having a weightage of 25%. Each preannounced test will consist of 20 objective type, 5 short questions/problems as well as one long answer type question. The student is expected to provide reasoning/solution/working for the answer. The candidates will attempt all question. Choice will be given only in long answer type. The question paper is expected to contain problems to the extent of 40% of total marks.
- Four Surprise Tests will be conducted having a weightage of 25%. Two best out of four objective/MCQ type surprise test will be considered towards final each of 12.5% weightage to the final. Each surprise test will include 20-25 questions.
- The books indicated as text-book(s) are suggestive. However, any other book may be referred or followed.

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LL.M. Two Years Programme

SEMESTER Inter-Disciplinary Papers/Elective Papers (Offered by the Centre)

SN	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
i.	LSR.507	General Legal Awareness	2	-	-	2	10	15	15	10	50
ii.	LSR.508	International Env. Law	2	-	-	2	10	15	15	10	50
iii.	LSR.509	Consumer Protection Law	2	-	-	2	10	15	15	10	50
iv.	LSR.510	Women and Law	2	-	-	2	10	15	15	10	50
v.	LSR.511	Introduction to the Law on Children in India	2	-	-	2	10	15	15	10	50
			2	-	-	**2**					50

A: Continuous Assessment: Based on Objective Type Tests
B: Mid Term Test 1: Based on Objective Type & Subjective Type Test
C: Mid-Term Test-2: Based on Objective Type & Subjective Type Test
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

Inter-Disciplinary/Elective Papers Paper-II: (Offered by the Centre)

SN	Paper Code	Course Title	L	T	P	Cr	% Weightage				E
							A	B	C	D	
i.	LSR.557	Environmental Law and Governance	2	-	-	2	10	15	15	10	50
ii.	LSR.558	Human Rights and Governance	2	-	-	2	10	15	15	10	50
iii.	LSR.559	Corporate Governance and Practices	2	-	-	2	10	15	15	10	50
iv.	LSR.560	Intellectual Property Laws	2	-	-	2	10	15	15	10	50
v.	LSR.561	Ethics in Research	2	-	-	2	10	15	15	10	50
			2	-	-	2					50

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School of Legal Studies and Governance

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LL.M. Two Years Programme

SEMESTER I

(Specialization in-Environmental Law/Human Rights Law/Corporate Law)

LSR.501: Research Methodology & Legal Writing

L	T	P	Credits	Marks
5	-	-	5	100

Unit-I **16 Hours**

1. Research- Concept, Meaning, Objectives and Types
2. Approaches to Research
3. Legal Research- Introduction, Nature, Scope and Manual of Legal Research Through Collaborative Learning Groups
4. Legal Research – A Tool for Codification and Legal Reform

5. Unit-II **16 Hours**

6. Research Design- Choice of Research Topic, Identification of Research Problem
7. Hypothesis and its formulation, Units of Analysis
8. Variables- Types and Relationships
9. Ethics in Research: Ethical Behaviour, Plagiarism in Research

Unit-III **16 Hours**

10. Techniques of Research Writing; Project and Research Proposals, Project Report, Research Paper and Monographs- Abstract, Referencing, Foot Note and Bibliography
11. Sources of Data Collection - Observation, Questionnaire and Schedule, Interview and Case Study, Surveys-Analysis, Interpretation

Unit – IV **16 Hours**

12. Law Reforms and Civil Society
13. Jurimetrics and Socio-metrics
14. Legal Research and Online Research Database-
    Rational and Significance of Online Database
    Use of Internet in legal research

Suggested Readings

1. Bryman, A., (2009),*Social Research Methods*, Oxford University Press, New York.
2. Deborah, K. Padgett (2008), *Qualitative Methods in Social Work and Research*, Sage Publications (CA).
3. Paul, K. Hatt & William J. Goode, (2006).,*Methods in Social Research*, Surjeet Publications, Delhi.
4. Menon, N. R. M. (Ed.) (1998), *A Handbook of Clinical Legal Education*, Eastern Book Company, Lucknow.
5. Morris, L. C. (1996), *Legal Research in Nutshell*,West Publishing Co. Minnesota.
6. Shawn, C. S. (2010), *International Adoption- A Legal Research Guide (Legal Research Guides)*, William's Hein & Co. New York.

7. William, J. G. & Paul K. H. (2006), *Methods in Social Research*, Mc Graw-Hill Book Company, London.
8. Young, P. V. (2010), *Scientific Social Surveys and Research*, P. H. Learning Pvt. Ltd., New Delhi.
9. Yvonne, N. B. (2009), *How to Write a Master's Thesis*, Sage Publications (CA).
10. P K Majumdar (2011), *Research Methods in Social Science*, Viva Books Private Ltd. New Delhi.
11. Kultar Singh (2007), *Quantitative Social Research Methods*, Sage India, New Delhi.
12. J. Paul Lomio (2011), *Legal Research Methods in a Modern World: A Course Book (0003 Edition)*, Djoef Publishing, Denmark.

LSR.502: Computer Applications

L	T	P	Credits	Marks
3	-	-	3	100

Unit I **10 Hours**

1. **Fundamentals of Computers-** Parts of Computers, Hardware, BIOS, Operating Systems, Binary System, Logic Gates and Boolean Algebra.
2. **Application Software-** Spreadsheet Applications, Word-Processing Applications, Presentation Applications, Internet Browsers, Reference Management, and Image Processing Applications.
3. **Computer Language-** Basic DOS Commands, Auto Hotkey Scripting Language, HTML and Basic Structure of a Webpage, Designing Websites.
4. **World Wide Web-** Origin and Concepts, Latency and Bandwidth, Searching the Internet, Advanced Web-Search Using Boolean Logic, Cloud Computing

Unit II **10 Hours**

5. **Use of Statistical Techniques in Analysis of Data-** Measures of Central Tendency, Measures of Dispersion, Correlation & Regression, Testing of Hypothesis, Test of Significance Z-Test and T-Test, Analysis of Variance (One Way and Two Way), Chi-Square Test of Independence

6. **DBMS-** Introduction, Components, Functions, Development of Database Systems, Advantages of Using DBMS, Data Abstraction, Data Models, Data Independence, Database Languages, Database Manager, Database Administrator, Database Users.

Unit III **10 Hours**

7. **Computerized Research/ E-Research**
   - Introduction
   - Ethnography of Internet
   - The Use of Internet as Object of Analysis
   - The Use of Internet as a Tool of Collection
   - Quality Research Using Online Focus Groups
   - Qualitative Research Using Online Personal Interviews
   - Online Social Surveys
   - Web Surveys
   - Mixing Modes of Survey Administration

Unit IV **10 Hours**

8. Ethical Consideration in Internet Research
9. Plagiarism and Internet Research

Suggested readings

1. Rajaraman, V., (2010), *Fundamental of Computer*, Delhi, PHI.
2. Anita Goel, (2010), Computer Fundamentals, Pearson.
3. Modern Operating System, Tanenbaum, PHI Publication.
4. Santosh Gupta, (2010), Research Methodology & Statistical Techniques, Delhi, Deep & Deep Publication (P) Ltd.

LSR.503: Law and Social Transformation in India

L	T	P	Credits	Marks
4	-	-	4	100

Unit-I **14 Hours**

1. Law and social change
   - Law as an instrument of social change
   - Law as the product of traditions and culture
   - Criticism and evaluation in the light of colonisation and the introduction of common law system and institutions in India and its impact on further development of law and legal institutions in India.
2. Religion and the law
   - Religion as a divisive factor
   - Secularism as a solution to the problem
   - Reform of the law on secular lines: Problems.
   - Freedom of religion and non-discrimination on the basis of religion
   - Religious minorities and the law

Unit-II **14 Hours**

3. Language and the law
   - Language as a divisive factor: formation of linguistic states.
   - Constitutional guarantees to linguistic minorities
   - Language policy and the Constitution: Official language; multi-language system.
   - Non-discrimination on the ground of language
4. Community and the law
   - Caste as a divisive factor
   - Non-discrimination on the ground of caste
   - Acceptance of caste as a factor to undo past injustices
   - Protective discrimination: Scheduled castes, tribes and backward classes.
   - Reservation; Statutory Commissions, Statutory provisions

Unit-III **14 Hours**

5. Regionalism and the law
   - Regionalism as a divisive factor
   - Concept of India as one unit
   - Right of movement, residence and business; impermissibility of state or regional barriers
   - Equality in matters of employment: the slogan "Sons of the soil" and its practice.
   - Admission to educational institutions: preference to residents of a state.

6. Women and the law
   - Crimes against women
   - Gender injustice and its various forms
   - Women's Commission
   - Empowerment of women: Constitutional and other legal provisions

7. Children and the law
   - Child labour
   - Sexual exploitation
   - Adoption and related problems
   - Children and education

Unit-IV **14 Hours**

8. Modernisation and the law
   - Modernisation as a value: Constitutional perspectives reflected in the fundamental duties
   - Modernisation of social institutions through law
   - Reform of family law
   - Agrarian reform - Industrialisation of agriculture
   - Industrial reform: Free enterprise v. State regulation
   - Industrialisation v. environmental protection
   - Reform of court processes
   - Criminal law:
   - Plea bargaining: compounding and payment of compensation to victims
   - Civil law: (ADR) Confrontation v. consensus; mediation and conciliation; Lok Adalats.
   - Prison reforms
   - Democratic decentralisation and local self-government

9. Alternative approaches to justice
   - The jurisprudence of Sarvodaya- Gandhiji, Vinoba Bhave; Jayaprakash Narayan Surrender of dacoits, Concept of Grama Nyayalayas, Mobile Courts.
   - E.Governance in administration of justice
   - Socialist thought on law and justice: An enquiry through constitutional debates on the right to property.
   - Indian Marxist critique of law and justice
   - Naxalite Movement: causes and cure.

Suggested readings

1. Galanter, M. (ed.) (1997), *Law and Society in Modern India*, Oxford University Press.
2. Lingat, R. (1998), *The Classical Law of India*, Oxford University Press.
3. Baxi, U. (1982), *The Crisis of the Indian Legal System*, Vikas, New Delhi.
4. Baxi, U. (ed.) (1988, *Law and Poverty Critical Essays*, Tripathi, Bombay.
5. Derret, D. (1999), *The State, Religion and Law in India*, Oxford University Press, New Delhi.
6. Seervai, H. M. (1996), *Constitutional Law of India*, Tripathi, Bobbay.
7. Basu, D. D. (1996), *Shorter Constitution of India*. Prentice - Hall of India (P) Ltd., New Delhi.
8. Deshta,S. & Deshta, K. (2000), *Law and Menace of Child Labour*, Anmol Publications,Delhi.

9. Malik, K. P. (2009), *Law and Social Transformation in India*. Pioneer Books, Faridabad.
10. Gunasekhare, S. Children, (1997). *Law and Justice*. Sage.
11. Jain, M. P. (2010), *Outlines of Indian Legal History*, Tripathi, Bombay.
12. Friedmann, W. (2004), *Law in a Changing Society*, University of California Press, Berkeley.

L	T	P	Credits	Marks
4	-	-	4	100

LSR.504: Legal Theory

Unit-I **14 Hours**

1. Meaning, Definition and Nature of Jurisprudence
2. Sources of Law
3. Natural Law Theories

Unit-II **14 Hours**

4. Analytical Positivism including Hart Fuller Debate
5. Pure Theory of Law
6. Sociological School of Law

Unit-III **14 Hours**

8. Realist School of Jurisprudence
9. Historical and Anthropological Jurisprudence
10. Right, Duty, Ownership, Possession and Person **Judicial Process** : Application of Doctrine of Precedent of India.

Unit-IV **14 Hours**

10. Feminist Jurisprudence

Constitutional Aspects
Law relating to Protection against Sexual Harassment including Criminal Law (Amendment) Act, 2013.
Protection of Women Against Domestic Violence Act, 2005
Prohibition of Dowry Act, 1961.
ITPA.

Suggested readings

1. Bowett, D. W. (1982), *Law of International Institutions*, Oxford University Press, USA.
2. Boderheimer, (1996), Jurisprudence-*The Philosophy & Method of Law*, Unversal, Delhi
3. R.W.M. Dias, (1994), *Jurisprudence* Indian Reprint-Adithya Books, Delhi.
4. Fitzgerald, (1999), *Salmond on Jurisprudence* Tripathi, Bombay.
5. Dhyani SN, (1985) *Jurisprudence-A Study of Indian Legal Theory*, CLP, All.

L	T	P	Credits	Marks
5	-	-	5	100

LSR.505: Applied Legal Studies – I

Unit-I **14 Hours**

1. 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

Unit-II **14 Hours**

2. Partnership Act
   Nature and essentials of partnership mutual rights and liabilities of partners, advantages of registration of firms.
3. Sales of Goods Act.
4. Negotiable Instruments Act.
5. Company Law: Role of Directors, Doctrines of Indoor Management and Ultra Vires.

Unit-III **14 Hours**

6. Law of Torts and Consumer Protection Act, 1986
   Foundation of Tortuous Liability.
   General Defences to an action of Tort
   Vicarious Liability
   Remoteness of Damages.
   Contributory Negligence
   Absolute and Strict Liability
7. Salient Features of Consumer Protection Act
   Meaning and definition of Consumer
   Consumer and Consumerism, Defects in Goods, Deficiencies in Services, CPA: Inclusions and Exclusions, CPA and the Professional Services, Consumer Remedies, Consumer Disputes: Jurisdictional Issues, Consumer Dispute Re-Dressal Agency at the District Level i.e. District Forum, Complaint Procedure, Misuse of CPA: Frivolous and Vexatious Complaints, White- Collar Crimes

Unit-IV **14 Hours**

8. Nature of International Law and its sources.
   Concept of sovereignty and its relevance today.
   Recognition of State and Governments.
   Extradition, Asylum, Nationality and Status of Refugees.
   International Court of Justice.
   UNO and its organs.
   Global Trade Regime under International Law.
9. Administrative Law and Right to Information
   Rule of Law
   Separation of Powers
   Delegated legislation
   Natural Justice
   Right to Information Act

Suggested readings

1. Galanter, M. (ed.) (1997), *Law and Society in Modern India*, Oxford University Press.

2. Singh, Avtar (2013), *Contract and Specific Relief*, Eastern Book Company. New Delhi.
3. Bangia, R. K., (2013), *Law Of Torts With Consumer Protection Act*, ALA. Delhi.
4. Markanda, P. C., (2010), *The Law of Partnership in India*. Lexis-Nexis, Delhi.
5. Singh, Avtar, (2013), *Introduction To Labour and Industrial Law*. Lexis-Nexis. Delhi

LSR.506: Computer Applications- Practical

L	T	P	Credits	Marks
-	-	4	2	50

XXX.000: Inter-Disciplinary-I (From any Other Centre)

L	T	P	Credits	Marks
2	-	-	2	50

Semester II

LSR.551: Judicial Process

L	T	P	Credits	Marks
4	-	-	4	100

Unit- I **14 Hours**

1. Nature of Judicial Process
   - Judicial process as an instrument of social ordering
   - Judicial process and creativity in law - common law model - Legal Reasoning and growth of law - change and stability
   - The tools and techniques of judicial creativity and precedent
   - Legal development and creativity through legal reasoning under statutory and codified systems
2. Special Dimensions of Judicial activism in Constitutional Adjudications;
   - Notions of Judicial Review
   - Constitutional Adjudication: Various Theories of Judicial Role.
   - Tools and techniques in policy-making and creativity in constitutional adjudication
   - Varieties of judicial and juristic activism
   - Problems of accountability and judicial law-making

Unit-II **14 Hours**

3. The Concepts of Justice
   - Justice or Dharma in Indian thought
   - Dharma as the foundation of legal ordering in Indian thought
   - The concept and various theories of justice in the western thought.
   - Various theoretical bases of justice: the liberal contractual tradition, the liberal utilitarian tradition and the liberal moral tradition.

Unit- III **14 Hours**

4. Judicial Process in India
   - Indian debate on the role of judges and on the notion of Judicial Review
   - The Independence of Judiciary and the Political Nature of Judicial Activism
   - Judicial activism and creativity of the Supreme Court - the tools and techniques of creativity
   - Judicial process in pursuit of constitutional goals and values - new dimensions of judicial activism and structural challenges

Institutional liability of courts and judicial activism - scope and limits

Unit-IV **14 Hours**

5. Relation between Law and Justice
   Equivalence Theories - Justice as nothing more than the positive law of the stronger class
   Dependency theories - For its realization justice depends on law, but justice is not the same as law.
   The independence of justice theories - means to end relationship of law and justice, the relationship in the context of the Indian constitutional ordering,
   Analysis of selected cases of the Supreme Court where the judicial process can be seen as influenced by theories of justice.

Suggested readings

1. Demobowski, H. (2001), *Taking the State to Court*, OUP, Delhi.
2. Sundar, N. & Thin, N. (2001), *Branching Out: Joint Forest Management in India*, OUP, Delhi.
3. Cardozo, M. (1995),*The Nature of Judicial Process*,Universal Publication, New Delhi.
4. Abraham, H. J. (1998), *The Judicial Process*, Oxford.
5. Stone, J. (1995),*Precedent and the Law: Dynamics of Common Law Growth*, Butterworths.
6. Friedmann, W. (1960), *Legal Theory*, Stevens, London.
7. Bodenheimer. (1997), *Jurispurdence - the Philosophy and Method of the Law*, Universal Universal Publication, Delhi.
8. Stone, J. (1999), *Legal System and Lawyers' Reasonings*,Universal Universal Publication, Delhi.
9. Baxi, U. (1980),*The Indian Supreme Court and Politics*, Eastern Book Company, Lucknow.
10. Dhavan, R. (1997),*The Supreme Court of India - A Socio -Legal Critique of its Juristic Techniques*. Tripathi, Bombay.
11. Rawls, J. (2000),*A Theory of Justice*,Universal Publication, Delhi.

LSR.552: Indian Constitution and New Challenges

L	T	P	Credits	Marks
4	-	-	4	100

Unit-I **14 Hours**

1. The Idea of Constitutionalism
   Nature of Indian Constitution
2. Constitutional Governance in India
   Judicial Activism and Judicial Restraint
   Public Interest Litigation: Uses and Abuses
   Independence of Judiciary

Unit-II **14 Hours**

3. State: Meaning and Definition

4. Fundamental Rights
   Right to Equality (Article 14-18)
   Fundamental Freedoms (19)
   Protections under Article 20
   Protection against Bonded Labour
   Freedom of Religion

Unit-III **14 Hours**

5. Right to life under Article 21-22.
6. Fundamental Duties

Unit- IV **14 Hours**

7. Directive Principles: Meaning and Importance
8. Harmonizing Fundamental Rights and Directive Principles
9. Legislative Relations between Centre and State with reference to environmental issues
10. Constitutional amendments.
11. Emergency Provisions
12. Power and Procedure of Amendment of Constitution

Suggested readings

1. Ackerman, B. (1997),*The Jurisprudence of Just Compensation*, Hart publishing Ltd.
2. Babbitt, B. (1996), *Federalism and the Environment,* Praeger Publishing.
3. Baxi, U. (1980), *The Indian Supreme Court and Politics*, Eastern Book Company, Lucknow.
4. Seervai, H. M. (1996), *Constitutional Law of India,* Tripathi, Bombay.
5. Basu, D. D. (1996), *Shorter Constitution of India.* Prentice - Hall of India (P) Ltd., New Delhi.

LSR.553 Comparative Public Law and Governance

L	T	P	Credits	Marks
4	-	-	4	100

Unit- I **14 Hours**

1. Concept, Nature and Importance of the Comparative Public Law
2. Concept and Theories of Constitutionalism and comparative study of U.K., USA and India
3. Emerging Trends of Constitutionalism

Unit- II **14 Hours**

4. Procedure of Constitutional Amendments in UK, USA, and India
5. Concept of Judicial Review and Accountability: Comparative Study with reference to U.S.,UK and India

Unit- III **14 Hours**

6. Nature of Federalism and Quasi-Federalism- India, UK and USA
7. Fundamental Rights: Comparative Study with reference to U.S.,UK and India

Unit- IV **14 Hours**

8. Comparative study of enforcements of fundamental rights in US,UK and India

9. Role of Media in national and international perspectives with reference to Good Governance
10. Parliamentary Privileges in US,UK and India

Suggested Readings

1. Basu D. D., (2010), *Commentary on the Constitution of India.* Lexis Nexis Butterworths Wadhwa, Nagpur.
2. Brownlie Ian & Goodwin Gill Guys, (2010),*Basic Documents on Human Rights.* Oxford University Press, New York.
3. Cane Peter, (2011),*Administrative Law*, Oxford University Press, New York,.
4. Elliott Mark & Thomas Robert, Public Law, Oxford University Press, New York, 2011.
5. Jain M. P., Indian Constitutional Law, LexisNexis Butterworths Wadhwa, Nagpur, 2010.
6. Rebecca Williams, (2010), *Unjust Enrichment and Public Law: A Comparative Study of England, France and the EU,* Hart Publishing, Houstan.
7. Loughlin Martin, (2004), *The Idea of Public Law*. Oxford University Press, New York.
8. Marks Susan,(2003),*The Riddle of All Constitutions: International Law, Democracy, and Critique of Ideology,* Oxford University Press, New York.
9. Tushnet Mark, Fleiner Thomas, (2012), *Routledge Handbook of Constitutional Law.* Routledge, New York.
10. Zines Leslie, (2006),*Constitutional Change in the Commonwealth.* Cambridge University Press, Cambridge.

LSR.554: Principles of Legislation and Interpretation

L	T	P	Credits	Marks
4	-	-	4	100

Unit- I **14 Hours**

1. The Principle of Utility
2. Doctrine of Pain and Pleasure
3. Principles of Constitutional Interpretation

Unit-II **14 Hours**

3. Classification of Statutes
4. Commencement, Extent and Operation of Act.

Unit-III **14 Hours**

8. Interpretation of Laws
9. Rules of interpretation of Statutes
   - Primary/ literal rule of interpretation
   - Mischief Rule of construction (Heydon's Rule)
   - Golden Rule of construction
   - Rule of Beneficial construction

Unit-IV **14 Hours**

10. Internal Aids to construction
11. External Aids of construction
12. Subsidiary Rules and Latin Maxims of interpretation
    - Ut res magis valet quam pareat
    - Expressio Unius Exclusio Alterius
    - Jus Dare and Jus Dicere
    - Ejusdum Generis
    - Redendo Singula Singulics
    - Construction in Bonam Partem
    - Harmonious Construction
    - Generalia Speclibus non Derogant
13. Indian Judiciary and Trends in Judicial Interpretation

Suggested readings

1. Upendra Baxi(2008), *Bentham's Utilitarian Theory*, Lexis Nexis.
2. P St. J Langan (2011), *Maxwell on the Interpretation of Statutes,* Jain Book Agency, Delhi.
3. Vepa P. Sarathi (2013), *Interpretation of Statutes*, Jain Book Agency, Delhi.
4. K. P. Chakravarty (2013), *Interpretation of Statutes*, Jain Book Agency, Delhi.
5. Avinash Dhamir & Hans Raj Arora. (2010), *A Compendium of Interpretative Techniques,* Twenty- First Century Publications, Patiala.
6. A. K. Yog, J. (2012), *Interpretation of Statutes*, Modern Law Publications, Allahabad
7. M.N. Rao & Amita Dhanda (2006). NS Bindra's *Interpretation of Statutes*, Lexis Nexis.
8. G. P. Singh (2012), *Principles of Statutory Interpretation*; Jain Book Agency. Delhi.

9. Avtar Singh & Harpreet Kaur (2014), *Introduction to Interpretation of Statutes*, Jain Book Agency, Delhi.

LSR.555: Applied Legal Studies – II

L	T	P	Credits	Marks
5	-	-	5	100

Unit-I **16 Hours**

1. 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.

Unit-II **16 Hours**

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

Unit-III **16 Hours**

3. Family Law
   - Concepts in Family Law.
   - Sources of Family Law in India.
   - Marriage and Dissolution of Marriage
   - Law relating to Adoption

Unit-IV **16 Hours**

4. Human Rights
   - Protection of Human Rights Act, 1993
   - Brief History of Human Rights: National and International Perspectives
   - UDHR, 1945
   - International Bill of Human Rights

Suggested readings

1. Galanter, M. (ed.) (1997), *Law and Society in Modern India*, Oxford University Press.
2. Dhirajlal, Ratanlal, (2013), *Law of Crimes*, LexisNexis
3. P S Jaswal & Nishta Jaswal, (2009), *Environmental Law*, Allahabad Law Agency.
4. Paras Diwan, Peeyushi Diwan (2008), *Modern Hindu Law: Codified and Uncodified*, Allahabad Law Agency
5. Year Book

L	T	P	Credits	Marks
-	-	2	1	50

LSR.556: Seminar

XXX.000: Inter-Disciplinary -II (From any other Centre)

Semester III

Optional Groups – I/II/III IV V

LSR.649: Seminar and Synopsis approval etc.

L	T	P	Credits	Marks
-	-	-	8	200

SEMESTER IV

Optional Groups – I/II/III (In continuation to Opted group in Semester III)

LSR.699: Dissertation, Continuous Evaluation, Submission and Viva Voce.

L	T	P	Credits	Marks
-	-	24	12	300

Optional Groups (Syllabus)

Group I - Environmental Law (EVL)

Semester III

L	T	P	Credits	Marks
4	-	-	4	100

EVL.691: Historical, Philosophical and Theoretical Foundation of Environment Protection

Unit-I 14 Hours

1. Introduction - Environment, Components of Environment, Nature and Mankind
   Environment Deterioration- Concept and Factors Responsible for Environment Deterioration
2. Natural Resources and Environment
   Forest Resources- Use and Over-Exploitation, Deforestation, Mining, Dams and their Effects on Forest
   Water Resources- Use and Over-Utilization of Surface and Ground Water, Floods, Drought, Conflicts Over Water, Dams- Benefits and Problems
   Mineral Resources- Use, Exploitation, and Impact on Environment
   Food Resources- World Food Problems, Modern Agriculture, Over-Grazing, Over Use of Fertilizer and Pesticide, Water Logging and Salinity
   Energy Resources- Growing Energy Needs, Renewable and Non Renewable Energy Sources Use of Alternate Energy Sources

Land Resources- Land Degradation, Man Induced Landslides, Soil Erosion and Desertification

3. Equitable Use of Resources for Sustainable Lifestyles

Unit- II **14 Hours**

4. Environmental Policy Making, Environmental Economics and Environmental Politics
5. Environmental Protection in India-
   Ethical, Religious and Political Perspectives
   Role of Religion in Environment Protection- Hindu, Muslim, Christian and Sikh Perspectives on Environment
6. Management and Protection by Specific Communities

Unit- III **14 Hours**

7. Environment Protection- Historical Perspectives in India, Modern India- Contribution of Environmentalists
8. Environmental Ethics
   Theories of Environment Ethics, and Moral Philosophy
   Eco-Centrism
   Anthropocentrism
   Biocentrism

Unit- IV **14 Hours**

9. Environmental Ethics and Movements
   Deep Ecology
   Feminism
10. Modern Concept of Sustainable Development
11. Globalization and Environment

Suggested Readings

1. Arnold, D. & Guha, R. C. (Ed.), (1995), *Nature, Culture, Imperialism- Essays on the Environmental History of South Asia*, Oxford University Press, Delhi.
2. Balee, W. (1998), *Advances in Historical Ecology*. Columbia University Press, New York.
3. Beinart, W. & Coates, P. (1995), *Environment and History*. Routledge, New Delhi.
4. Carson, Rachel, (1962),*Silent Spring*. Houghton Mifflin, Boston.
5. Santa, F. (Ed.) (1994), *Historical Ecology- Cultural Knowledge & Changing Landscapes*, School of American Research Press, New Mexico.
6. Gadgil, M. & Guha, R. C. (1992), *This Fissured Land- An Ecological History of India*, Oxford University Press, New Delhi.
7. Thakur, K. (2007),*Environmental Protection- Policy and Laws in India*, Deep and Deep Publication, New Delhi.
8. Richard Evanoff, (2010),*Bioregionalism and Global Ethics: A Transactional Approach to Achieving Ecological Sustainability, Social Justice, and Human Well-Being*. Routledge, New Delhi.
9. Chaturvedi, R.G., (2010), *Ancient Law of Environment*. Universal Law Publishing, Delhi.
10. Aruna Venkat, (2011), *Environmental Law and Policy*, PHI, Delhi

EVL.602- Environment Law & Policy- International

L	T	P	Credits	Marks
4	-	-	4	100

Development

Unit- I **14 Hours**

1. Emergence of International Environmental Law
   Nature and Sources
   Development of International Environmental Law as a Discipline
   Hard Law and Soft Law
   Development through Treaties, Framework Convention-Protocol Approach
   In-Built Law Making Process within Various Multilateral Environmental Agreements (MEAS), Conference of Parties (COP), Secretariats, Scientific and Technical Committees
2. International Environment Policy and Principles
   Inter-Generational Equity
   Sustainable Development
   Precautionary Principle
   Polluter Pay Principle
   Absolute Liability Principle

Unit-II **14 Hours**

3. United Nations Conference on Human Environment/ Stockholm Declaration, 1972
4. United Nations Conference on Environment & Development at Rio De Janeiro, 1992/ Rio Declaration, Role of Agenda 21 in the Development of International Legal Instruments and Mechanism
5. Special Session of the UN General Assembly, 1997, Follow-Up of the Rio Mandate
6. World Summit on Sustainable Development, 2002, Johannesburg Plan of Implementation
7. World Summit on Sustainable Development (Rio+20), 2012, Outcome Document- The Future We Want
8. GEO Reports

Unit-III **14 Hours**

9. Climate Change Regime- UNFCCC,1992, Kyoto Protocol, Bali Conference on Climate Change, 2007, Copenhagen Climate Council, 2009, Cancun Climate Change Conference, 2010, Durban Climate Change Conference, 2011, Doha Amendment to The Kyoto Protocol 2012, Inter- Government Panel On Climate Change (IPCC)
10. Ozone Layer Protection Movement- Vienna Convention for the Protection of Ozone Layer, Montreal Protocol on Substances that Deplete the Ozone Layer
11. Protection of Forests and to Combat Desertification- Non-Legally Binding Authoritative Statement of Principles for a Global Consensus on the Management, Conservation and Sustainable Development of all Types of Forests, United Nations Forum on Forests, United Nations Convention to Combat Desertification.
12. Biological Diversity- Convention on Biological Diversity Cartagena Protocol on Bio-Safety, Nyoga, Supplementary Protocol on Liability and Redress to the Cartagena Protocol on Bio-Safety

Unit-IV **14 Hours**

13. UNEP- Structure, Functions of Governing Council, The UNEP Secretariat, Role of UNEP in Environment Protection
14. Millennium Development Goals (MDG)

15. Regional Approach towards Environment Protection in SAARC- Regional Problems of Environment, SAARC Charter and Summit Declarations, Action Plan on Environment, Dhaka Convention
16. Selected Conventions- Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat (1971), Convention on International Trade in Endangered Species of Wild Fauna and Flora (1973), Convention on Migratory Species of Wild Animals (1979)

Suggested Readings

1. Axelrod, Regina S.(ed.), (2011),*The Global Environment*. CQ Press, Washington DC.
2. Baviskar, Amita, (2011). *In the Belly of the River*. Oxford University Press, New Delhi.
3. Bell, B. & Gillivray, M.G., (2009), *Environmental Law*, Oxford University Press, New York.
4. Bodansky, Daniel, (2011), *The Art And Craft of International Environment Law*. Oxford University Press, London.
5. Bowett, D. W., (1982),*Law of International Institutions*, Oxford University Press, New York.
6. Callicott, J. Baird & Frodeman, Robert (ed.), (2009), *Encyclopedia of Environmental Ethics and Philosophy*,Gale Cengage Learning, London.
7. Leelakrishnan, P., (2011), *Environmental Law Case Book*. Lexis Nexis Butterworths, Nagpur.
8. Myeni, S. R., (2008), *Environmental Law*. Oxford University Press, New York.
9. Sadeleer, N. D., (2012), *Environmental Governance and the Legal Bases Conundrum*,Oxford University Press, Oxford
10. Walker, Gordon, (2012), *Environmental Justice*. Springer Press, New York.

SEMESTER IV

EVL.603- Environment Protection and Sustainable Development

L	T	P	Credits	Marks
4	-	-	4	100

Unit-I **14 Hours**

1. Introduction to the Concept of Sustainable Development
2. Environment and Development- Conflicting Issues, Environment in the Age of Liberalization, Privatization and Globalization
3. Emergence of Philosophy of Sustainable Development and Sustainability
4. Ecological Sustainability

Unit-II

5. Establishment of the World Commission on Environment and Development (Brundtland Commission) 1984-87 and Report of the Commission
6. United Nations Commission on Sustainable Development (CSD)
   Establishment and Mandate of CSD
   Role and Responsibility of CSD
7. United Nations Conference on Sustainable Development, 1992/ Agenda 21
8. Rio+20 and The Future We Want
9. GIO-5

Unit-III **14 Hours**

10. Johannesburg Convention, 2002 (World Summit On Sustainable Development, 2002)
11. Environmental Sustainability- North and South
12. Definitions of and Debates on Political Ecology, Access to and Control Over Resources Case and the Water Politics in India
13. The Growth of Social Movements Around Natural Resources and Environment
14. Dam Campaigns

Unit- IV **14 Hours**

15. Transnational Networks- Case of the Multilateral Development Bank Campaign, the "Greening of Business"
16. The Next Bottom Line? Arguments for Green Business Case- the Monsanto Company and GMOs, Critics of Green Business
17. Formal International Negotiations- Climate Change
18. The "Mainstreaming" of Environmental Concerns- Financial Markets
19. Multi-Stakeholder Negotiations at the Global Scale- The Case of the World Commission on Dams
20. The World Summit on Sustainable Development and Beyond

Suggested Readings

1. Agarwal, A, Et Al, (Ed.) (1984),*State of India's Environment*, Oxford University Press, Delhi.
2. Baumol, W. E. & Oates, W. J. (1988), Theory *of Environmental Policies*. Cambridge University Press, Cambridge.
3. Borrie, W. D. (1988), *Population, Environment and Society*, Oxford University Press, Oxford.
4. Crush, J. (Ed.) (1995), The *Power of Development*, Rutledge, New York.
5. Escobar, A. (1995), *Encountering Development- the Making and Unmaking of the Third World,* Princeton University Press, West Sussex.
6. Watson, James K.R., (2013), *The WTO and the Environment*, Routledge, London.
7. Gadgil, M. & Guha, R.C. (2001),*Ecology and Equity- the Use and Abuse of Nature in Contemporary India,* Penguin, Delhi.
8. Gorz, A. (1980), *Ecology as Politics,* South End Press, Boston.
9. Mart, H. (1993), *An Anthropological Critique of Development- the Growth of Ignorance,* Routledge, New York.
10. Tietenberg. T, (2003), *Environmental and Natural Resource Economics*. Pearson Education, New York.

EVL.604- Emerging Paradigms of Legal Framework on Environmental Management in India

L	T	P	Credits	Marks
4	-	-	4	100

Unit-I **14 Hours**

1. Pre Independence Environmental Legislations in India

Unit-II **14 Hours**

2. Post Independence Environmental Legislations in India and Implementing Mechanism

Unit-III **14 Hours**

3. Public Participation and Environmental Decision Making: Concept, Object, Significance, Advantages & Disadvantages and Techniques
4. Impact Assessment of Socio-Economic Environment: Prediction and Assessment
5. Biological Environment and Environment Impact Assessment

Unit- IV **14 Hours**

6. Environment Auditing
7. Corporate Liability for Environmental Protection
8. Introduction of Environmental Management
9. Environment Assessment in India- Legislative Aspects and Current Practices

Suggested Readings

1. Bhatt, S., (2009), *Environment Protection*,APH Publishing Corporation, Delhi.
2. Dube, Indrajit, (2007), *Environmental Jurisprudence*, Lexis Nexis Butterworths, Nagpur.
3. Jaswal, P. S. & Jaswal, Nishtha, (2011), *Environmental Law*, Allahabad Law Agency, Faridabad.
4. Khan, I. A., (2009), *Environmental Laws*, Central Law Publication, Allahabad.
5. Lear, Shannon O., (2010), *Environmental Politics*, Cambridge University Press, New Delhi.
6. Louis, J. Kotza, L. J., (2013), *Global Environmental Governance- Law and Regulation for 21st Century*, Edward Elgar Publishing Ltd., Cheltenham.
7. Mallick, M.R., (2012), *Environment & Pollution Laws*, Professional Book Pub., Delhi.
8. Shastri, S. C., (2010),*Environmental Laws*, Eastern Book Company, Lucknow.
9. Stephens, Tim, (2009), *International Courts and Environmental Protection*. Cambridge University Press, Cambridge.
10. Tiwari, N. D., (2011), *Environmental Law*, Allahabad Law Agency, Faridabad.

L	T	P	Credits	Marks
4	-	-	4	100

EVL.605- Role of Judiciary, NGOs in Environmental Protection

Unit-I **14 Hours**

1. Theories of Environmental Protection
   - Bentham's Doctrine of Utility and Environment Protection
   - Roscoe Pound's theory of Social Engineering and Environmental Protection
   - The Contemporary Environmental Issues

Unit-II **14 Hours**

2. Social Engineering and Sustainable Development
3. Indian Judiciary on Environment Protection
4. Public Interest Litigation and Environment Protection

Unit-III **14 Hours**

5. Judicial Response and Environment- Expanding Horizons of Article 21
   - Right to Clean and Healthy Environment- A Basic Human Right
   - Right to Clean and Healthy Environment
   - Right to Pure Drinking Water
   - Right to Protection against Noise Pollution *Vis a Vis* Right to Freedom of Religion
   - Right to Life *Vis a Vis* Right to Livelihood
   - Right to Life *Vis a Vis* Right to Freedom of Trade, Business and Profession

Unit- IV **14 Hours**

10. Role of Judiciary in Enforcement of International Environmental Laws
    - Doctrine of Inter-Generational Equity
    - Polluter Pay Principle
    - Doctrine of Absolute Liability
    - Precautionary Principle
    - Environmental Rights- Third Generation Rights
11. Role of NGOs in Environment Protection
12. Joint Forest Management

Suggested Readings

1. Jaswal, P. S. & Jaswal, N. (2011), *Environmental Law*. Allahabad Law Agency, Faridabad.
2. Khan, I. A. (2009),*Environmental Laws*, Central Law Publication.
3. Shastri, S. C. (2010),*Environmental Laws*, Eastern Book Company.
   Dube, I. (2007),*Environmental Jurisprudence Polluter's Liability*, Lexis Nexis.

GROUP-II- Human Rights Law (HRL)

Semester III

HRL.601 International Human Rights Law

L	T	P	Credits	Marks
4	-	-	4	100

Unit I **14 Hours**

1. International Concern: Protection of Individual in International Law
2. League of Nations and Human Rights
3. Human Rights and the United Nations Charter:
   (a) Normative and Institutional Framework of the UN
   (b) Role of the permanent organs of the UN, Human Rights Council, UN High Commissioner for Human Rights

Unit II **14 Hours**

4. Universal Declaration on Human Rights:
   (a) History of the Declaration
   (b) Structure of the Declaration
   (c) Legal Significance
5. Nature and Characteristic of Covenants ICCPR and ICESCR
6. Optional Protocols and Implementation Machinery

Unit III **14 Hours**

7. Major Conferences on Human Rights
8. Convention Against Torture
9. Rights of Indigenous People· woman, child, Minorities, Aged

Unit IV **14 hours**

10. European Convention on Human Rights
11. American Convention on Human Rights
12. African Charter on Human and People's Rights

13. Asia and Human Rights

Suggested Readings

1. Brownlie Ian & Goodwin Gill Guys, (2010), *Basic Documents on Human Rights*, Oxford University Press, New York.
2. Amartya Sen, (2009), *The Idea Justice*, New Delhi, Penguin Books.
3. Conor Greaty and Adam Tomkins (1996) (Eds), *Understanding HumanRights*, London, Manshell,.
4. David Beetham, (1995), *Politics and Human Rights*, Oxford: Blackwell.
5. Gurpreet Mahajan (1998) Ed., *Democracy, Difference and Social Justice*, Oxford University Press New Delhi .
6. James Nickel, (1987), *Making Sense of Human Rights: Philosophical Reflections on the Universal Declaration of Human Rights*, Berkeley: University of California Press.
7. John Rawls, (2001), *Law of the People*, Cambridge: Harvard University Press .
8. Michael Freeden, (1998), *Rights*, Delhi: World View, (Indian Reprint).
9. Michael Freeman, (2002), *Human Rights: An Interdisciplinary Approach*, Oxford: Polity.
10. Upendra Baxi, (2008), *The Future of Human Rights*, Oxford University Press, New Delhi.

L	T	P	Credits	Marks
4	-	-	4	100

HRL.602-Protection & Enforcement of Human Rights in India

Unit-I **14 Hours**

1. History and Development of Human Rights in Indian Constitution.
2. Constitutional Philosophy.
3. Nature of Fundamental Rights- General.

Unit-II **14 Hours**

4. Right to Equality: Gender Justice and Empowerment of Women. Special provisions for Weaker Sections of society Reservation Policy under the Constitution.
5. Freedom of Speech and Expression, Reasonable Restrictions, Right to Information
6. Secularism, Freedom of Religion,
7. Protection to Minorities under the Constitution

Unit- III **14 Hours**

8. Fundamental Duties.
9. Right to Life and Personal Liberty. New Dimension. Judicial approach.

Unit-IV **14 Hours**

10. Implementation and Enforcement Mechanism of Human Rights in India.
11. Protection of Human Rights Act, 1993.
12. Emerging regime of new human rights in India, Taking guidance from Directive Principles of State Policy.

Suggested Readings

1. B.P. Singh, (2008). *Human Rights in India; Problems and Perspectives*, Deep & Deep, New Delhi.
2. Aftab Alam, (2004), *Human Rights in India: Issues and Challenges*, Raj Publications, Delhi.
3. Shanker Sen, (2009),*Tryst with Law Enforcement and Human Rights: four decandes in Indian Police*, APH, New Delhi.
4. Harsh Bhanwar, (2008), *Human Rights Law in India: Protection and Implementation of the Human Rights*, Regal Pub, New Delhi.
5. Jaiswal Jaishree, (2005), *Human Rights of accused and juveniles: Delinquent in conflict and Law*, Kalpaz, Delhi.
6. L.K. Thakur, (2002), *Essentials of POTO and other Human Rights Laws*, Author Press New Delhi.
7. Awasthi , S.K. & R.P. Kataria, (2002), *Law Relating to Protection of Human Right*, Orient Publishing, New Delhi.
8. K.P. Saksena, (2003) (ed.), *Human Rights and the Constitution: Vision and the Reality*, Gyan Publishing, New Delhi.

L	T	P	Credits	Marks
4	-	-	4	100

HRL.603- Human Rights of Vulnerable and Disadvantaged Groups

Unit-I **14 Hours**

1. Meaning and Concept Vulnerable and Disadvantaged Groups
2. Groups, Customary, Socio-Economic and Cultural Problems of

Unit-II **14 Hours**

3. Status of women and children in International and national perspective
4. Women's Rights –International and National Standards
5. Human Rights of Children-International and National Standards

Unit- III **14 Hours**

6. Status of Social and Economically Disadvantaged people
7. Status of Indigenous People and the Role of the UN
8. Status of SC/ST and Other Indigenous People in the Indian Scenario
9. Human Rights of Aged and Disabled
10. The Minorities and Human Rights

Unit-IV **14 Hours**

11. Human rights of vulnerable groups
    - Stateless Persons
    - Sex Workers
    - Migrant Workers
    - HIV/AIDS Victims
    - Trans-genders
12. Convention on the Elimination of all Forms of Discrimination Against Women.
13. Juvenile Justice (Care and Protection of Children) Act,2000
14. The Sexual harassment of Women (Prevention, Prohibition and Redressal) Act, 2013
15. Protection of Children from Sexual Offence Act, 2012

Suggested Readings

1 D.C. Nanjunda, (2008), *Child Labour and Human Rights: A Prospective*, Kalpaz Pub,Delhi.
2. S.N. Chaudhary, (2005), *Human Rights and Poverty in India: Theoretical Issues*, Concepts Delhi.
3. R. Ganga, (2007), *Children's Rights as basic Human Rights*, Reference Press New Delhi.
4. Saksena Anu, (2004), *Gender and Human Rights: Status of Women Workers in India*, Shipra Publications, Delhi.
5. Gurusamy, S., (2009), *Human Rights and Gender Justice*, APH New Delhi.
6. A.K. Jha, (2006), *Child Abuse and Human Rights*, N.D.: Anmol.
7. D.V. Rao, (2004), *Child Rights: A Perspective on International and National Law*, Manak, New Delhi.
8. V.V. Devasia, (2009), *Women, Social Justice and Human Rights*, New Delhi.
9. B.R. Sharma, (2002), *Encyclopaedia of Human Rights and Women's Development*, Sarup & sons, New Delhi.
10. G.S. Bhargava, (2001), *Human Rights of Dalits: Social Violation*, New Delhi: Gyan.

SEMESTER IV

L	T	P	Credits	Marks
4	-	-	4	100

HRL.651- Criminal Justice System and Human Rights

Unit-I: 14 Hours

1. Concept of Crime and Criminal Liability
2. Human Rights and Criminal procedure, Sentencing, execution and human rights, clemency and remission of sentences etc.

Unit-II: 14 Hours

3. Human Rights under Criminal Justice System
4. Role of police and criminal justice administration – Human rights issues

Unit-III: 14 Hours

9. Detenu and Human Rights
10. Constitutional safeguards

Unit-IV: 14 Hours

11. Inmates of Institutional Homes, Prison and Human Rights
12. Protective Homes, Reformatory Homes and other Institutions
13. Prison, Prisoners life and Prisoners' rights
14. Judiciary as guardian of human rights, Compensation to crime victims, P.I.L. in criminal justice

Suggested Readings

1. South Asia Human Rights Documentation Centre (SAHRDC), (2006) *Handbook of Human Rights and Criminal Justice in India: the System and Procedure*, Oxford: New Delhi.

2. Noorjahan Bava, (2000), *Human Rights and Criminal Justice Administration in India*, New Delhi.
3. Anthony Amatrudo, (2014), Human Rights and the Criminal Justice System, Routledge.
4. Kalpana Kannabiran (Editor), Ranbir Singh (Editor) (2008) ,Challenging The Rules(s) of Law: Colonialism, Criminology and Human Rights in India, SAGE Publications Pvt. Ltd.
5. Aftab Alam, (2004), *Human Rights in India: Issues and Challenges*, Raj Publications, Delhi.
6. Shanker Sen, (2009), *Tryst with Law Enforcement and Human Rights: four decades in Indian Police*, APH, New Delhi:.
7. Harsh Bhanwar, (2008), *Human Rights Law in India: Protection and Implementation of the Human Rights*, Regal Pub, New Delhi.
8. Jaiswal Jaishree, (2005), *Human Rights of accused and juveniles: Delinquent in conflict and Law*, Kalpaz, Delhi .

HRL.652- Refugees and Humanitarian Law

L	T	P	Credits	Marks
4	-	-	4	100

Unit-I — **14 Hours**

1. Determination of Refugee Status under the Refugee Convention of 1951.
2. Protocol of Refugee Convention1967
3. Human Rights of the Refugees

Unit-II — **14 Hours**

4. Solution to Refugee Problem:
   (a) Resettlement in Third Country
   (b) Local Integration
   (c) Voluntary or Forced Repatriation
   (d) Comprehensive Responses
5. Role of UNHCR

Unit-III — **14 Hours**

6. Contemporary Developments in Refugee Law
   (a) International Burden Sharing
   (b) International Safe Countries Burden
   (c) Temporary Protection
   (d) Environmental refugees
   (e) Safety Zones
7. Internally Displaced Persons, UN Guiding Principles on Internal Displacement 1998, Refugee Law and Policy in India.

Unit-IV — **14 Hours**

8. Nature, Basic Principles; Historical Development since 1899
9. Protection of Victim of War- Wounded, Sick; Shipwrecked; and Prisoners of War
10. Implementation of International Humanitarian Law

11. Role of the International Committee of the Red Cross in Implementation of International Humanitarian Law.

Suggested Readings

1. Ahmed, Imtiaz, and Dasgupta, Abhijit & Ors. (2004), *State society and displaced people in South Asia*, University Press Ltd, Dhaka.
2. Black, Richard & Robinson, Vaughan, (1993), *Geography and refugees: Pattern and process of change*, Belhaven Press.
3. Dhavan, Rajeev, (2004), *Refugee law and policy in India,PILSARC*, New Delhi.
4. Patil, V T & Trivedi, P R (2001), *Refugees and human rights*, Authors Press, Delhi.
5. Sinha, Manoj Kumar, (2002), *Humanitarian intervention by the United Nations*,Manak Pub., New Delhi.
6. Gary D. Solis (2010), *The Law of Armed Conflict: International Humanitarian Law in War*, Cambridge University Press.
7. Dieter Fleck, (2013), *The Handbook of International Humanitarian Law*, OUP Oxford.

Group III- Corporate Law (CPL)

Semester III

L	T	P	Credits	Marks
4	-	-	4	100

CPL.601: Corporate Law and Governance

Unit- I — **14 Hours**

1. Corporate Incorporation
   - Certificate of Incorporation
   - Memorandum and Articles of Association
   - Doctrine of Ultra Vires
   - Doctrine of Indoor Management

2. Managerial issues
   - Directors: Appointment, Removal, Position, Powers and Duties of Directors.
   - Audit Committee: It's Role.
   - Company Secretary: Qualification, Appointment and Duties
   - Officer who is in default: Definition of Officer who is in default
   - Liability of independent directors.

3. Meetings
   - Types of Meetings
   - Procedure of calling meeting
   - Resolutions and its kinds

Unit- II — **14 Hours**

4. Oppression & Mismanagement and Investigation
   - Rule in Foss v. Harbottle
   - Prevention of Oppression
   - Prevention of Mismanagement

Role & Powers of the Company Law Board
Role & Powers of Central Government
5. Company Investigation.

Unit-III **14 Hours**

6. Corporate Liquidation
   - Winding up of Companies
   - Mode of winding up of the companies
   - Compulsory Winding up under the Order of the Tribunal
   - Voluntary winding up
   - Contributories (Payment of liabilities)

Unit – IV **14 Hours**

7. Corporate Governance and Social Responsibility
   - Importance of Corporate Governance
   - Different system of Corporate Governance
   - Impact of Legal Traditions and the Rule of Law on Corporate Governance
   - Legal Reforms of Corporate Governance in India
   - Reports of the various Committees on Corporate Governance
   - Emerging Trend based on the recommendation of the Committees
8. Corporate Social and Environmental Responsibility
9. Criminal Liability of Corporations

Suggested readings

1. Smith and Keenan's (2002), Company Law..
2. Andrew Lidbetter, (1999) Company Investigations and Public Law
3. Saleem Sheikh & William Rees, (2002)Corporate Governance & Corporate Control
4. Avtar Singh, Company Law, (2007), Eastern Book Company, Lucknow.
5. Gower's Principles of Company Law 8th Edition 2008, R. Cambray & Co. Pvt. Ltd.
6. Smith and Keenon's Company Law.
7. S. K. Verma & Suman Gupta(2005)., Corporate Governance and Corporate Law Reform in India.
8. Companies Act, 1956
9. Suman Gupta. (1992), Shareholder's Democracy: Fact or Fiction

CPL.602: Competition and Consumer Protection Law

L	T	P	Credits	Marks
4	-	-	4	100

Unit- I **14 Hours**

1. Competition
   - An Introduction
   - Definition and objectives of Competition and Competition Law
2. History of Competition Law
   - (USA, UK, Europe) Relevant provisions of Sherman's Act
   - Indian scenario with an overview of MRTP Act, 1969
   - Raghavan Committee Report
3. International co-operation for competition
   - WTO agreements and the Act

Unit- II **14 Hours**

4. Anti-competitive Agreement- Appreciable adverse effect
   - Horizontal and Vertical agreements

Effects doctrine

5. Prohibition of anti-competitive agreements
   - Concerted practices and parallel behaviour
   - Cartel and Cartelisation
   - Bid rigging and collusive bidding
   - Tie-in-arrangements
   - Exclusive supply agreement
   - Resale price maintenance agreement

6. Abuse of Dominant Position
   - Relevant market
   - Predatory behaviour
   - Predatory pricing
   - Discriminatory practices
   - Relevant market

Unit-III **14 Hours**

7. Combination
   - Value of Assets
   - Turnover
   - Acquisition
   - Conglomeration
   - Joint Venture
   - Merger and Amalgamation
   - Notification

8. Competition Commission of India
   - Establishment and composition
   - Duties
   - Procedure for inquiry
   - Powers
   - Competition fund

9. Competition Advocacy
   - Competition Policy

Unit – IV **14 Hours**

10. Consumer Protection Act, 1986 and its applicability to Competition Law
    - Definition of Consumer
    - Definition of Service
    - Deficiency in Service
    - Unfair Trade Practices
    - Overlapping areas

Suggested readings

1. Ramappa. T., Competition Law in India- Policy, Issues and Development (2006), Oxford University Press.
2. Nahar. S. Mahala, Law, Practice and Procedure (2006), Commercial Law Publishers.
3. Dhall .Vinod, Competition Law Today, (ed.) (2007), Oxford University Press
4. Bangia R.K., A Handbook of Consumer Protection Laws and Procedure, (2004), Allahabad Law Agency.
5. Singh Avtar, Law of Consumer Protection: Principles and Practice, (2005), Eastern Book Company.

6. Verma S.K. & M.Afzal Wani, A Treatise on Consumer Protection Laws, (ed.) (2004), Indian Law Institute.
7. Anoop K. Kaushal, Universal's Practical Guide to Consumer Protection Law, (2006), Universal law Publishing Company, New Delhi.
8. Pavleen, Consumer Decision- Making, (2006), Deep & Deep Publication.
9. Aggarwal, Prof. V. K., Consumer and Protection Law and Practice, 6th Ed. (2008)
10. Mittal D.P., Taxmann's Competition Law (2007)
11. Universal Guide to Competition Law in India-(2003), Universal Law Publishing Company, New Delhi.

CPL.603: Regulation of Capital Market and Foreign Investment

L	T	P	Credits	Marks
4	-	-	4	100

Unit-I **14 Hours**

1. Meaning of Capital market, Primary and Secondary market, Trends in regulation of capital markets
Modes of Foreign Investment in India Foreign Direct Investment in India: Background and concepts Industrial Policy, Sector Wise Cap and Foreign Investment Procedural Aspects in FDI

Unit-II **14 Hours**

2. Corporatization of stock exchanges.
Trading in Security – Securities Contract Regulation Act, 1956 – Companies Act, 1956, FEMA
Instruments of Trading – Need for planning and development for financial instruments – Government and Corporate Securities.
Trading Methods – Trading Ring, On-line Trading, Carry Forward Systems – Risk management – Investor Protection.
Government Securities Market – Government Debt Instruments – Short Term and Long Term Instruments – Trading in Debt Instruments – Gilt Edged Market.
Securities Market Indicators – Sensex
Interest rates – Role of Interest rates in determining value of security – Interest rates and its influence on money market and capital market.
Indian Depository System – Need – Paperless Trading – Benefits – Need for educating investors

3. Role of SEBI and RBI

Unit-III **14 Hours**

4. Policy framework for regulation of FDI

5. Investment Schemes for Non-Residents External Commercial Borrowings
Investment by Non Resident Indians in Immovable Property in India Establishment of Branch or office in India

Unit – IV **14 Hours**

6. Bilateral Investment Treaties: Constitutional Perspective Bilateral Investment Treaties: Need and applicability Standards of Protection Treaties vis a vis State Responsibility and Contractual Obligations
7. Dispute Resolution under Investment Treaties Basic Concepts in Investment Treaty Arbitration Jurisdiction and Admissibility in Treaty Arbitration Procedural Aspects in Treaty Arbitration
8. Emerging paradigms with special reference to disclosure of Foreign Income and Assets.

Suggested readings

1. Aliber, R.Z., Exchange Risk and Corporate International Finance, London, Macmillan
2. Alworth, Julian S., The Finance Investment and Taxation Decisions of Multinationals, Basil Blackwell, London
3. Bartiett, C. and Ghoshal, S., Transnational Management: Text, Cases and Readings in Cross Border Management, Chicago, Irwin
4. Bhalla, V.K. and S. Ramu, International Business Environment and Management, Anmol Publication, Delhi.
5. Chturvedi, S.K., Foreign Investment Law, Deep and Deep Publications, New Delhi.
6. Myneni, S.R., Law of Investment and Security, Asia Law House, Hyderabad.
7. Ronen, S., Comparative and Multinational Management, New York, John Wiley
8. Samantha Shurety, E-business with Net Commerce, Addison Wesley, Singapore
9. Shapir, Alan C., Multinational Financial Management, Prentice Hall of India, New Delhi
10. Shapiro, A.C., International Financial Management, Allyn and Bacon, Boston
11. Singhania, D.C., Foreign Collaborations and Investment India, Universal Law Publishing, Delhi
12. Taxmann's SEBI MANUAL, Taxmann Publications (P.) Ltd., New Delhi.
13. Taxmann's Foreign Exchange Management Manual, Taxmann Publication (P.) Ltd., New Delhi
14. *The Indian Financial System*, Dorling Kindersely (India) Pvt. Ltd., Pearson Education, New Delhi
15. Bowett, D. W. (1982). *Law of International Institutions*. Oxford University Press, USA.
16. Abdullah, F.A., Financial Management for the Multinational Firm, Englewood Cliffs, Prentice Hall Inc., New Jersey.
17. Investment and Securities Markets in India – V. A. Avdhani.

Semester IV

L	T	P	Credits	Marks
4	-	-	4	100

CPL.651: Banking and Insurance Law

Unit- I

1. The Evaluation of Banking Services and its History in India
   History of Banking in India.
   Bank nationalization and social control over banking.
   Various types of Banks and their functions.
   Contract between banker and customer: their rights and duties.

Role and functions of Banking Institutions
Salient Features of Banking Regulation Act and the Role of RBI

Unit-II

2. Lending by Banks and Recent Trends of Banking System in India
   Advances, Loans and Securities.
   Direct, collateral and miscellaneous Securities.
   Default and recovery.
   Bank Debt Recovery Tribunals.
   The Securitization and Reconstruction of Financial Assets and Enforcements of
   Security Interest Act, 2002 (Definitions, Section 13 – Enforcement of security interest, Section 17 - Right to appeal.).

Unit-III

3. General Principles of Law of Insurance
   Definition, nature and history.
   Contract of insurance and principles.
   The Risk – commencement, attachment, assignment.
   Types of insurances.
   Policy and its Legal Status.

Unit – IV

4. Recent Trends in Insurance
   Insurance against third party risks (relevant provisions from Motor Vehicles Act, 1988.)
   Liability Insurance.
   Consumer Protection and Banking and Insurance Services.
   The Insurance Act, 1938 and the Insurance Regulatory & Development Authority Act, (IRDA), 2000.
   Miscellaneous Insurance Schemes: New Dimensions (Group Life Insurance, Mediclaim, Sickness).

Suggested readings

1. Tannan, M.L., Tannan's Banking Law and Practice in India, 2008, Wadhwa and Co.
2. Tannan, M.L., Tannan's Banking Law and Practice in India, 2004, India Law House.
3. Tannan: Banking Law and Practice in India (in 3 vols.), 22nd Ed., R. Cambray & Co. Pvt. Ltd.
4. Gupta, S. N., The Banking Law in Theory and Practice (in three volumes), 2006, Universal Law Publishing Co.
5. Sharma, B.R. and Nainta, R.P., Principles of Banking Law and Negotiable Instruments Act 2004, Allahabad Law Agency
6. Nainta, R.P., Baking System, Frauds and Legal Control, 2005, Deep and Deep Publications.
7. Murthy, K.S.N., and Sarma, K.V.S., Modern Law of Insurance in India, 2002, Lexis Nexis Butterworth
8. Birds, John, Modern Insurance Law, 2003, Universal Publishing Co.
9. Shah, M. B., Landmark Judgments on Insurance, 2004, Universal Publishing Co.

10. Mishra, M.N., Law of Insurance Principles and Practice, 2008, Radhakrishan Prakashan
11. Rangarajan, C., Handbook of Insurance and Allied Laws.

L	T	P	Credits	Marks
4	-	-	4	100

CPL.652: Law of Corporate Finance and Securities Regulations

Unit-I **14 Hours**

1. Public Issue of Shares
   - Prospectus
   - Remedies for misrepresentation
   - SEBI and Stock Exchange guidelines
2. Share Capital
   - Nature and Kind of Shares
   - Transfer, Transmission, Surrender and forfeiture of Shares
   - Purchase by Company of its own shares
   - Issue of shares at premium and discount
   - SEBI Guidelines

Unit-II **14 hours**

3. Shareholders' Rights (Various rights of shareholders and variation of shareholders rights.
4. Debentures; Difference between Share and Debentures; Kinds of Debenture; Remedies of Debenture Holder; Company Charges.

Unit-III **14 Hours**

5. Insider Trading; SEBI's Guidelines on Insider Trading
6. Securities and Exchange Board of India (SEBI): Constitution, Powers and Functions

Unit–IV **14 Hours**

7. Reconstruction, Amalgamation and Take Over: Provisions in Company Law and SEBI Guidelines
8. Auditors:
   - Appointment, powers, duties and removal of auditors
   - Special Audit
   - Director Responsibility statement in Board Report
   - National Advisory Committee on Accounting Standards

Suggested readings

1. Gower's Principles of Company Law, Sweet & Maxwell Thomson, 2006.
2. Smith and Keenon's Company Law, Pearson Education Ltd., 2009.
3. Suman Gupta: Shareholder's Democracy: Fact or Fiction, Publication Division, University of Delhi, 1992.
4. Companies Act, 1956.
5. Verma J.C., Corporate Mergers, Amalgamations & Takeovers, Bharat Law House, 2008.

Interdisciplinary courses Offered by the Centre (in Semester I and II)

Semester I

Semester I

L	T	P	Credits	Marks
2	-	-	2	50

LSR.507: General Legal Awareness

L	T	P	Credits	Marks
2	-	-	2	50

Unit- I **7 Hours**

1. Fundamental Rights
   Fundamental Duties
   Self-defense during Crime

2. Free Legal Aid
   Rights of Arrested Person
   Rights of Accused Person
   Rights of Consumer

Unit- II **7 Hours**

3. Application under RTI
   Recording of FIR
   Complaint in Criminal Cases

2. Maintenance to wife, children & aged person
   Registration of Marriage & remedy in case of marriage dispute
   Registration of Berth & Death
   How to apply for bail
   Lok Adalat, Alternative Dispute Resolution

Suggested readings:

1. Jain M. P., (2012), *Constitutional Law*, LexisNexis, New Delhi.
2. J. N. Pandey, (2014), *Constitutional Law of India*, Central Law Agency, Allahabad.
3. H. O. Agarwal (2014), *Human Rights*, Central Law Publication, Allahabad.
4. G. P. Tripathi (2015), *Constitutional Law –New Challenges*, Central Law Publication, Allahabad.
5. S. C. Tripathi (2015), *Arbitration & Conciliation*, 7th Ed. Central Law Publication, Allahabad.
6. Murthy YSR, (2007), Human Rights Handbook, LexisNexis, LexisNexis, New Delhi

LSR. 508 International Environmental Law

L	T	P	Credits	Marks
2	-	-	2	50

Unit I **7 Hours**

1. Nature of International Environmental Law
2. Development of International Environmental Law
3. Principles of International Environment Laws: Inter-generational Equality, Sustainable Development, Precautionary Principle, Polluter Pay Principle Absolute Liability
4. Major International Conferences on Environmental Protection
5. Multilateral Environmental Agreements:
   (a) Climate Change
   (b) Ozone Layer Protection
   (c) Forest
   (d) Biodiversity

Unit II **7 Hours**

6. International Institutions International Environmental Governance
7. United Nations Environment Programme
8. Inter-Governmental Penal on Climate Change
9. United National Forum on Forest
10. GEO Report
11. Role of International Tribunal in Environmental Protection

Suggested Readings

1. Axelrod, Regina S.(ed.), (2011),*The Global Environment*, CQ Press, Washington DC.
2. Baviskar, Amita, (2011), *In the Belly of the River*, Oxford University Press, New Delhi.
3. Bell, B. & Gillivray, M.G,(2009). *Environmental Law*, Oxford University Press, New York.
4. Bodansky, Daniel, (2011), *The Art And Craft of International Environment Law*, Oxford University Press, London.
5. Bowett, D. W., (1982), *Law of International Institutions*, Oxford University Press, New York.
6. Callicott, J. Baird & Frodeman, Robert (ed.), (2009), *Encyclopedia of Environmental*

L	T	P	Credits	Marks
2	-	-	2	50

LSR.509: Consumer Protection Law

Unit-I **7 Hours**

1. Market Form and Consumer Interest
2. Perfect Competition/Monopolistic Competition
3. Consumer Education
4. Statutory Consumer Rights under the CPA

5. Procedure of Filing a Complaint
6. Grievance Redressal Mechanism
7. Vexatious complaints and Offences/ Penalties

Unit-II **7 Hours**

8. Consumer Problems
9. Proof of Purchase
10. Product and Service Quality- defects and deficiencies
11. Information Right of Consumers-Labeling etc.
12. Guarantees and Warranties
13. Organizational set up under Consumer Protection Act:
14. Consumer Protection Councils at the Central, State and District Levels
15. Adjudicatory Bodies and their composition
16. Powers and Jurisdiction of Adjudicatory Bodies
17. Appellate Jurisdiction of the National Commission.

Suggested Readings

1. VK Agarwal(2009),*Consumer Protection Law and Practice*,Bharat Law House (P) Ltd. Delhi.
2. Avtar Singh (2005),*Law of Consumer Protection: Principles & Practices*; Eastern Book Company, Lucknow.
3. DPS Verma (2002),*Developments in Consumer Protection in India*, Springer.
4. D P Wadhwa, J. (2009), *Law of Consumer Protection*; Lexis Nexis.

L	T	P	Credits	Marks
2	-	-	2	50

LSR.510: Women and Law

Unit-I **7 Hours**

1. Constitutional Status of Women
2. Philosophy of Social, Economic and Political Justice.
3. Philosophy of Reproductive Justice
4. Equality before Law, Provisions relating to reservation for Women (Article 14- 18)
5. Right to life, Right to reproductive choices
6. Directive Principles of State policy for the protection of interests of women
7. Provisions regarding Election under the Constitution for representation of women

Unit-II **7 Hours**

8. Provisions against Adultery
9. Protection of Women against Rape
10. Outraging the Modesty of Women and Law against Sexual Harassment
11. Kidnapping

12. Sati Prohibition Law
13. Law relating to Domestic Violence
14. Law relating Eve Teasing
15. Indecent Representation of Women Act
16. PNDT Act.

Suggested Readings:

1. R.C. Nigam (1965), Criminal Law, Asia Publishing House, New Delhi.
2. Ratan Lal & Dhiraj Lal (2013), Indian penal Code, Lexis Nexis.
3. K.D. Gour (2008),Indian Penal Code, Universal Law Pub. Co. P. LTD, Delhi .
4. S.N.Mishra (2005), Indian Penal Code 1860, Central Law Publications.
5. Ratanlal & Dhirajlal, The Code of Criminal Procedure,Lexis- Nexis Publication, Gurgaon.
6. Jain M P. (2012),Code of criminal procedure, Lexis- Nexis, New Delhi.

L	T	P	Credits	Marks
2	-	-	2	50

LSR.511: Law on Children in India

Unit-I **7 Hours**

1. Application of Social and legal status of child
2. Constitutional Protection to Children
3. Protective legislations for the child

Unit-II **7 Hours**

4. The National Commission for child
5. Legal control of employment of child labour
6. Child under litigation with reference to Civil Procedure Code 1908.

Suggested Readings

1. The National Commission for Child
2. Indian Law Institute, Child and the Law
3. Upendra Baxi, Law and Poverty
4. National Law School Seminar Report on the Rights of the Child (1991).
5. Tripathi S.C.(2014),Law relating to women and Children. Central Law publishing : Allahabad.

LSR. 512: Fundamentals of Criminal Law **7 Hours**

L	T	P	Credits	Marks
2	-	-	2	50

Unit 1
Nature and Definition of Crime

1. Distinction between Crime and Tort
2. Stages of Crime (Intention, Preparation, attempt and commission of Crime
3. Elements of Crime, Actus Reus and Mensrea, General Explanations
4. Punishment

Unit 2 7Hours

5. General Exceptions
6. Kidnapping and Abduction,
7. Offences against Body—Rape, custodial rape, Marital rape and assault
8. Offences against marriage
9. Bailable and Non-bailable offence
10. FIR
11. Relevancy of Evidence

Suggested Books

1. Prof. T. Bhattacharya(2008),*The Indian Penal Code*,Central Law Agency
2. PSA Pillai(2012),*Criminal Law*, Lexis Nexis, Gurgaon.
3. R.C. Nigam (1965), *Criminal Law*,Asia Publishing house.
4. Ratanlal&DhirajLal(2013), :*Indian penal Code*,Lexis Nexis.
5. Ratanlal&Dhirajlal, *The Code of Criminal Procedure*, Lexis Nexis Publication, Gurgaon.
6. Monir M.: (Chief Justice(2013),*Law of Evidence (being a commentary on the Indian Evidence Act,1872 as Amended by Act 13of 2013)*, Universal law publisher.

Semester II

LSR.557: Environmental Law and Governance

L	T	P	Credits	Marks
2	-	-	2	50

Unit- I **7 Hours**

1. Emergence of Environmental Law
   Concept of Environmental Law & Policy
   Environmental Law and the Indian Constitution
   Other Major Laws and

Environment (IPC, Cr.PC, Torts)
Environmental Equity and Governance

2. International Environmental Law
   Emergence of International Environmental Law
   Fundamental Principles
   Application of International Environmental Law
   Introduction to Trade & Environment

Unit- II **7 Hours**

3. Major International Environmental Laws
   UNFCCC, 1992 & Kyoto Protocol, 1997
   Treaty on Antarctic & Polar Regions – 1961
   UN Convention of Law of the Sea, 1982 and Regional Seas Convention
   International Water Courses
4. International Environmental Organizations and Negotiations

Suggested Readings

1. Arnold, D. & Guha, R. C. (Ed.), (1995). *Nature, Culture, Imperialism- Essays on the Environmental History of South Asia.* Oxford University Press, Delhi.
2. Balee, W. (1998), *Advances in Historical Ecology*,Columbia University Press, New York.
3. Beinart, W. & Coates, P. (1995), *Environment and History*, Routledge, New Delhi.
4. Carson, Rachel, (1962), *Silent Spring*. Houghton Mifflin, Boston.
5. Santa, F. (Ed.) (1994). *Historical Ecology- Cultural Knowledge & Changing Landscapes*, School of American Research Press New Mexico.
6. Gadgil, M. & Guha, R. C. (1992), *This Fissured Land- An Ecological History of India*. Oxford University Press, New Delhi.
7. Thakur, K. (2007), *Environmental Protection- Policy and Laws in India*, Deep and Deep Publication, New Delhi.
8. Richard Evanoff, (2010), *Bioregionalism and Global Ethics: A Transactional Approach to Achieving Ecological Sustainability, Social Justice, and Human Well-Being*. Routledge, New Delhi.
9. Chaturvedi, R.G., (2010, *Ancient Law of Environment*. Universal Law Publishing, Delhi.
10. Aruna Venkat, (2011), *Environmental Law and Policy*. PHI, Delhi.

L	T	P	Credits	Marks
2	-	-	2	50

LSR.558: Human Rights and Governance

Unit-I **7 Hours**

1. League of Nations and Human Rights
2. Human Rights under the United Nations Charter:
   (a) Normative and Institutional Framework of the UN

(b) Role of the permanent organs of the UN, Human Rights Council, UN High Commissioner for Human Rights

3. International Bill of Human Rights: UDHR, ICCPR, ICESCR
4. History and Development of Human Rights in Indian.
5. Human Rights and Indian Constitution.
6. Preamble, Fundamental Rights, Directive Principles of State Policy (DPSP)
7. Indian Judiciary and Human Rights in India.

Unit- II **7 Hours**

8. The Protection of Human Rights Act, 1993
9. National Human Rights Commission
10. State Human Rights Commission
11. Contemporary Issues relating to human rights in India.
12. Human Rights and Refugee
13. Human Rights and Corruption
14. Human Rights and Environmental Protection

Suggested Readings

1. B.P. Singh, (2008), *Human Rights in India: Problems and Perspectives*, New Delhi: Deep & Deep.
2. Aftab Alam,(2004), *Human Rights in India, Issues and Challenges*, Delhi: Raj Publications.
3. Shanker Sen, (2009),*Tryst with Law Enforcement and Human Rights: four decandes in Indian Police*, New Delhi: APH.
4. Harsh Bhanwar,(2008),*Human Rights Law in India: Protection and Implementation of the Human Rights*, Regal Pub New Delhi:.
5. Jaiswal Jaishree, (2005), *Human Rights of accused and juveniles: Delinquent in conflict and Law*, Kalpaz Delhi.

L	T	P	Credits	Marks
2	-	-	2	50

LSR. 559: Corporate Governance and Practices

Unit-I **7 Hours**

1. Evolution of Corporate Governance – Ancient and Modern Concept
2. Concept of Corporate Governance, Generation of Value from Performance
3. Principles of Corporate Governance
4. Business Ethics vis-à-vis Corporate Governance
5. Corporate Social Responsibilities and good corporate citizenship

6. Unit-I **7 Hours**

6. Need for Legislation of Corporate Governance
7. Legislative Provisions of Corporate Governance in Companies Act 1956, Sec urities (Contracts and Regulations) Act, 1956 (SCRA), Depositories Act 1996, Sec urities and Exchange Board of India Act 1992, Listing Agreement,
8. Banking Regulation Act, 1949 and Other Corporate Laws
9. Legal Provisions relating to Investor Protection

Suggested readings

1. Andrew Lidbetter, (1999), *Company Investigations and Public Law*
2. Saleem Sheikh & William Rees, (2002), *Corporate Governance & Corporate Control*
3. Avtar Singh, *Company Law*, (2007),Eastern Book Company, Lucknow.
4. Gower's *Principles of Company Law* 8th Edition 2008, R. Cambray & Co. Pvt. Ltd.
5. Smith and Keenon's *Company Law.*
6. S. K. Verma & Suman Gupta, (2005),*Corporate Governance and Corporate Law Reform in India.*
7. Companies Act, 1956 as amended up to date.

L	T	P	Credits	Marks
2	-	-	2	50

LSR. 560: Law of Copyrights

Unit-I **7 Hours**

1. Introduction & Overview of the concept of property
2. Industrial property and non-industrial property
3. Historical background of IPR
4. Importance of human creativity in present scenario
5. Different forms of IP and its conceptual analysis

Unit-II **7 Hours**

6. Copyright: Meaning, object, nature and scope
7. Salient features of Indian Copyright Act, 1957
8. Remedies against violation of copyright

Suggested readings

1. P. Narayanan. (2008), *Intellectual Property Law,* EBC. Lucknow.
2. Davind Vaver and L.Bently. (2004), *Intellectual Property in the New Millennium: Essays in Honour of William R. Cornish.* Cambgirdge. U.K.
3. P. Ganguli. (2001), *Intellectual Property Rights: Unleashed the knowledge economy,* Tata Mc Graw Hill Co.
4. M.K.Bhandhari, (2015), *Law Relating to Intellectual Property Rights,* CLP,Allahabd.
5. Meenu Paul, (2006), *Intellectual Property Laws,* CLP, Allahabad.

L	T	P	Credits	Marks
2	-	-	2	50

LSR.562: Ethics in Research

Unit-I **7 Hours**

1. Evolution and the development of Research Ethics
2. Locating ethics in research
3. Consent
4. Vulnerable and non-competent subjects

Unit-I **7 Hours**

5. Privacy and Confidentiality
6. Balancing Harms and benefits
7. Justice in Research
8. Law and Research
9. Institutional Policies on Research Ethics
10. UGC Guidelines
11. Social Sciences/Sciences and the Research Ethics

Suggested readings

1. Andrew Kothari C.R.(2014), *Research Methodology*, New age international publishers Ltd, New Delhi.
2. Ian Gregory(2005), *Ethics in Research*, Bloomsbury Publishing,U.K.
3. Piccolo, Francesco Lo (2009), *Ethics and planning research*, Ashgate publishing Ltd.
4. Guthrie Gerard.(2010),*Basic research Methods*,Gage Publication, London.
5. Ransome Paul.(2013),*Ethics and Values in social Research*, Palgrave Macmillan.
6. Walliman Nicholas(2011),*Your research Project* Sage, New Delhi.

पंजाब केन्द्रीय विश्वविद्यालय

संसदीय अधिनियम 25 (2009) के द्वारा स्थापित

Central University of Punjab

Established vide Act No. 25 (2009) of Parliament

Annexure 19.2.2

Centre for Human Genetics & Molecular Medicine

Ref. No. CUPB/HGMM/15/174 Dated: 16-11-2015

Sub: Meetings of Board of Studies and School Boards.

In response to the notice no. CUPB/CC/15/on/1173, Kindly find the Minutes of the proceedings of the meeting of School Board of School of Health Sciences and Minutes of the proceedings of the meeting of Board of Studies of the Centre.

16.11.2015

Dr. Anjana Munshi,CoC
Associate Professor

Registrar 17/11

DR (A)

2 (15)

Centre for Human Genetics and Molecular Medicine

Ref no: CUPB/Human/15/82 Dated: 21/09/2015

Subject: Minutes of the proceedings of the meeting of School Board of School of Health Sciences.

A meeting of the School Board of School of Health Sciences was held on 21st September, 2015 at 11:30 A.M. in the committee room of the VC's office to review the agenda of Board of Studies. Following decisions were taken:

All the recommendations from the Board of Studies were approved in the School Board.

In addition the School Board discussed the agenda item no. 6 was discussed and a new centre "Centre for Molecular Diagnostics and Advanced Instrumentation" was proposed under the School of Health Sciences. The centre will start certificate course, diploma course, two master's programmes, one in Advanced Instrumentation and another in Molecular Diagnostics subject to approval.

21/9/2015.

Dr. Anjana Munshi, Member, Associate Professor and Coordinator CUPB

Prof. A.J.S. Bhanwar, Member, Department of Human Genetics, G.N.D.U. Amritsar

Prof. Rakesh Tyagi, Member, Special Centre for Molecular Medicine, J.N.U. New Delhi

21/9/2015

Dr. Preeti Khetarpal, Member, Assistant Professor, CUPB

21/9/15

Dr. Sandeep Singh, Member, Assistant Professor, CUPB

21/9/15

Dr. Monisha Dhiman, Member, Assistant Professor, CUPB

21/9/2015

Dr. Harish Chander, Member, Assistant Professor, CUPB

Dr. Sabyasachi Senapati, Member, Assistant Professor, CUPB

21/09/2015

Dr. Neeraj Kumar, Member, Assistant Professor, CUPB

Praveen Sharma

Ms. Praveen Sharma, Ph.D. Student

Raman

Ms Raman Preet Kaur, Ph.D. student

Abhilash

Mr. Abhilash, M. Sc. Student

Mr. Rajinder, M.Sc. Student

AS Dhawan 21/9/15

Prof. A.K. Dhawan, Chairperson
Dean, School of Health Sciences, CUPB

Centre for Human Genetics and Molecular Medicine

Ref no: Dated: 21/09/2015

Subject: Minutes of the proceedings of the meeting of Board of Studies of the Centre.

A meeting of the Board of Studies of the Centre for Human Genetics and Molecular Medicine was held on 21st September, 2015 at 10:00 A.M. in the committee room of the VC's office for the review of syllabus of the postgraduate programmes and Ph.D. programmes in Human Genetics and in Molecular Medicine. Following decisions were taken:

1. The representation (Annexure-I) given by students of M.Sc. Ist semester, BOS considered and recommended that Centre for Human Genetics and Molecular Medicine will be offering 2 M.Sc. Courses as M.Sc. (Life Sciences with specialization in Human Genetics) and M.Sc. Life Sciences (Life Sciences with specialization in Molecular Medicine) along with 2 Ph.D. courses as Ph.D. Human Genetics and Ph.D. Molecular Medicine from session 2015-16 onwards.
2. The course structure and detailed syllabus for M.Sc. (Life Sciences with specialization in Human Genetics); M.Sc. Life Sciences (Life Sciences with specialization in Molecular Medicine); Ph.D. Human Genetics and Ph.D. Molecular Medicine for session 2015-16 is approved with minor modifications as per recommendations of Academic Council (Dated March 5, 2015; vide item no. AC:6:2015:4) and subsequent approval by Executive Council (Dated March 16, 2015; vide item no. EC:14:2015:3C).
3. The course structure and detailed syllabus of M.Sc. (Life Sciences with specialization in Human Genetics) and M.Sc. (Life Sciences with specialization in Molecular Medicine) for session 2016-17 was reviewed with incorporation of suggested changes and approved.
4. The course structure and detailed syllabus of Ph.D. Human Genetics for session 2016-17 was reviewed with incorporation of suggested changes and approved.
5. The course structure and detailed syllabus of Ph.D. Molecular Medicine for session 2016-17 was reviewed with incorporation of suggested changes and approved.
6. The nomenclature of common courses naming has been changed for Life Sciences common courses. LS will be prefix for all common courses and will be followed by L(Theory)/ P (Practical)/ S (Seminar)/ T (Tutorial) and/or D (Dissertation) for Human Genetics as well as Molecular Medicine. The course numbers which are specialized for individual M.Sc. shall remain the same while the suffix will be changed accordingly.
7. 'Basics of Biochemistry' name has been changed to 'Basic and Clinical Biochemistry' for theory as well as practical courses. Similarly 'Introduction to Cell Biology' has been changed to 'Introduction to Cell and Molecular Biology' for theory and practical courses. Contents of 'Cell Biology' and 'Molecular Biology' need to be clubbed together in 'Introduction to Cell and Molecular Biology' for theory and practical courses

8. More practicals will be added to Basic and Clinical Biochemistry practical course.
9. 'LMM.528: Cancer Biology' has been changed to 'LML.528: Molecular and cellular Oncology' while 'LMM.529: Signal Transduction' has been changed to 'LML.529: Molecular Endrinology'. 'LSL.702: Good Laboratory Practices' has been changed to 'Biosafety, Bioethics and Good Laboratory Practices'. HGL.621 has been changed to 'Structural and Pharmacogenomics'. LSL.603 has been changed to 'Bioinformatics and Computational Biology'. LML.704 has been changed to 'Advanced Techniques in Cellular and Molecular Biology'. HGL.703 has been changed to 'Advanced Human Cytogenetics and Molecular Genetics'. HGL.704 has been changed to 'Advanced Human Genomics and Epigenomics'.
10. New Elective course 'HGL.605: Advances in Nutrigenomics' shall be introduced.
11. The modified syllabus approval shall be carried out by seeking approval from all the experts via email.

Prof. A.K. Dhawan, Member
Dean, School of Health Sciences, C.U.P.B

Prof. A.J.S. Bhanwar, Member, Department of Human Genetics, G.N.D.U. Amritsar

Prof. Rakesh Tyagi, Member, Special Centre for Molecular Medicine, J.N.U. New Delhi

Prof. S.M.S. Chahal, Member, Department of Human Genetics, Punjabi University, Patiala

Dr. Preeti Khetarpal, Member, Assistant Professor, C.U.P.B

Dr. Monisha Dhiman, Member, Assistant Professor, C.U.P.B

Dr. Sabyasachi Senapati, Member, Assistant Professor, CUPB

Dr. Neeraj Kumar, Member, Assistant Professor, CUPB

Dr. Harish Chander, Member, Assistant Professor, C.U.P.B

Dr. Sandeep Singh, Member, Assistant Professor, C.U.P.B

Dr. Jyoti Prakash, Member, Assistant Professor, CUPB

Ms. Praveen Sharma, NAAC Student representative

Mr. Saurav Kalra, NAAC Student representative

Dr. Anjana Munshi, Chairperson
Associate Professor and Coordinator

(126)

Centre for Human Genetics and Molecular Medicine

Ref no .... **Dated:** ....

Subject: Submission of syllabus of postgraduate courses and course work of Ph.D.

A meeting of the Board of Studies of the centre for Human Genetics and Molecular Medicine was held on 21st September, 2014 at 10:00 A.M. followed by School Board of School of Health Sciences at 11:30 A.M. in the committee room of the VC's office for the review of syllabus of the postgraduate programmes and Ph.D. programmes in Human Genetics and in Molecular Medicine. The approval has been taken from the experts (emails received with their consent) and the copy of following courses has been enclosed for your kind information.

1. M.Sc. Life Sciences with specialization Human Genetics (Batch 2015-16) (Annexure I)
2. M.Sc. Life Sciences with specialization Molecular Medicine (Batch 2015-16) (Annexure II)
3. M.Sc. Life Sciences with specialization Human Genetics (Batch 2016-17 and onwards) (Annexure III).
4. M.Sc. Life Sciences with specialization Molecular Medicine (Batch 2016-17 and onwards) (Annexure IV)
5. Course work of Ph.D. in Human Genetics. (Annexure V)
6. Course work of Ph.D. in Molecular Medicine. (Annexure VI)

Submitted for kind information and necessary action.

Dr. Anjana Munshi **Associate Prof.**	**Dr. Preeti Khetarpal** **Asstt. Prof.**	**Dr. Sandeep Singh,** **Asstt. Prof.**
Dr. Monisha Dhiman, **Assistant Professor,**	**Dr. Harish Chander,** **Assistant Professor**	**Dr. Sabyasachi Senapati,** **Assistant Professor**
Dr. Neeraj Kumar, **Assistant Professor,**		

(Curriculum development committee)

Dr. Anjana Munshi, CoC

Sabyasachi Senapati

To VC. through Rgr.

Prof. Ashok Dhawan
Dean School of

(File and file

DR

8094
02/11/15

7411-73

Subject: Re: Revised Course Structure and Content

From: sukhmohinder singh chahal (smschahal@rediffmail.com)

To: anjanadurani@yahoo.co.in;

Date: Wednesday, 28 October 2015 5:53 PM

Dear Dr. Munshi,

I have gone through the attached revised course structures and contents of the M.Sc. Human Genetics, Ph.D. Human Genetics, M.Sc. Life Sciences, M.Sc. Medical Medicine and Ph.D. Molecular Medicine syllabi, among others, running in your institute. I find them to my satisfaction and accordingly give my consent to the syllabi of these courses.

With kind regards,

On Wed, 07 Oct 2015 16:50:56 +0530 Anjana Munshi wrote

> Dear Sir ,The Course structure and content have been revised as per your suggestion. KIndly go through and give your consent so that we can submit the files to DAA for record.
> Best regardsDr. Anjana Munshi
> Associate Professor and COC,
> Centre for Human Genetics and Molecular Medicine
> School of Health Sciences,
> Central University of Punjab,
> Mansa Road,Bathinda, Punjab, India

Prof. Sukh M. S. Chahal
HOD, Department of Human Genetics
Coordinator UGC SAP (DRS-I)
Former Dean, Faculty of Life Sciences
Punjabi University
Patiala 147 002 (Punjab), INDIA

Cell: +919876096304

(123)

Subject: re

From: Amarjit Singh Bhanwer (ajsbhanwer@gmail.com)

To: anjanadurani@yahoo.co.in;

Date: Thursday, 29 October 2015 8:58 PM

Dear Dr Munshi,
I have gone through the final syllabus attached with your mail. I hereby approve it and give my consent for the same.

With regaeds
Amarjit

Professor Dr AJS Bhanwer
Ex Dean, Faculty of Life Sciences
Director, Internal Quality Assurance Cell
Ex Coordinator UGC SAP II
Department of Human Genetics
Guru Nanak Dev University
Amritsar 143 005, India
Mobile: 09814103474, 09501114480
Fax: +91-183-2258820, 2258819
Residence: +91-183-2450011
Phone (Office) +91-183-2450601-14 Ext 3278
Official Email: amarjit.human@gndu.ac.in

(7.2.2)

Centre for Human Genetics and Molecular Medicine

School of Health Sciences
Central University of Punjab, Bathinda
M.Sc. Programme in Life Sciences
(specialization Human Genetics)

Credit Structure of M.Sc. Life Sciences with specialization Human Genetics

Course type	Required as per CBCS system, UGC	Actual Credit distribution
Foundation	10 - 15% i.e.7.2 to 10.8	9
Elective	25 - 35% i.e.18 to 25.2	21
Core	50 - 65% i.e. 36 to 46.7	42
Total credits (excluding dissertation)		**72**

Centre for Human Genetics and Molecular Medicine

School of Health Sciences

Central University of Punjab Bathinda

Semester I

S.No	Paper Code	Course Title	L	T	P	Cr
		Foundation courses				
1	HGS.501	Research Methodology	2	-	-	2
2	HGS.502	Biostatistics	2	-	-	2
3	HGS.503	Biostatistics (P)	-	-	1	1
		Core courses				
4	HGS.504	Cell Biology	3	-	-	3
5	HGS.505	Cell Biology (P)	-	-	1	1
6	HGS.506	Biochemistry	3	-	-	3
7	HGS.507	Biochemistry (P)	-	-	1	1
8	HGS.508	Genetics	3	-	-	3
9	HGS.509	Genetics (P)	-	-	1	1
		Elective course (from the same centre)				
10	HGS.510	Human Cytogenetics and Human Biochemical Genetics	4			4
11	HGS.511	Human Cytogenetics and Human Biochemical Genetics (P)	-	-	1	1
12	LMM.510	Concepts and Prospects of Molecular Medicine	5	-	-	5
		Elective course (interdisciplinary)				
13	.XXX	Interdisciplinary Course-1	2			2
		Total	19	0	5	**24**
Interdisciplinary courses offered to students of other centre						
14	HGS.512	Basics of Human Genetics	2	-	-	2
15	HGS.513	Basics of Microscopy	2	-	-	2
16	HGS.514	Concepts of Immunogenetics	2	-	-	2
17	HGS.515	Gene, Genome and Genomics	2	-	-	2

L: Lectures, T: Tutorial, P: Practical, Cr: Credit

Centre for Human Genetics and Molecular Medicine

School of Health Sciences
Central University of Punjab, Bathinda

HGS.501: Research Methodology **Credit Hours: 2**

Course Objectives: To ensure that the students of molecular medicine understands various aspects of research related methods, technical/scientific writings and literature search.

Unit 1 **5 Lectures**

General principles of research: Meaning and importance of research, critical thinking, formulating hypothesis and development of research plan, review of literature, interpretation of results and discussion.

Unit 2 **10 Lectures**

Technical writing: Scientific writing that includes the way of writing Synopsis, research paper, poster preparation and presentation, and dissertation.

Unit 3 **5 Lectures**

Library: Classification systems, e-Library, web-based literature search engines

Unit 4 **16 Lectures**

Entrepreneurship and business development: Importance of entrepreneurship and its relevance in career growth, characteristics of entrepreneurs, developing entrepreneurial competencies, types of enterprises and ownership (large, medium SSI, tiny and cottage industries, limited, public limited, private limited, partnership, sole proprietorship) employment, self-employment and entrepreneurship, financial management-importance and techniques, financial statements- importance and its interpretation, and Intellectual Property Rights (IPRs).

Suggested Reading:

1. Gupta, S. (2005). *Research methodology and statistical techniques.* Deep & Deep Publications (p) Ltd. New Delhi.
2. Kothari, C.R. (2008). *Research methodology (s).* New Age International (p) Limited. New Delhi.
3. Standard /Reputed Journal authors' instructions.

HGS.502: Biostatistics **Credits Hours: 2**

Course Objectives: This course will give a basic but significant exposure towards better understanding of biostatistics and application. Applications of biostatistical approaches are pivotal in testing hypothesis, designing experiments, analyzing experimental data and interpreting the results of biological research.

Unit 1 **6 Lectures**

Overview of Biostatistics: Difference between parametric and non-parametric statistics, Univariant and multivariant analysis, Confidence interval, Errors, Levels of significance, Hypothesis testing.

Unit 2 **8 Lectures**

Descriptive statistics: Measures of central tendency and dispersal, Histograms, Probability distributions (Binomial, Poisson and Normal), Sampling distribution, Kurtosis and Skewness.

Unit 3 **8 Lectures**

Experimental design and analysis: Sampling techniques, Sampling theory, Various steps in sampling, collection of data-types and methods.

Unit 4 **14Lectures**

Inferential Statistics: Student's t-test, Paired t-test, Mann-Whitney U-test, Wilcoxon signed-rank, One-way and two-way analysis of variance (ANOVA), Critical difference (CD), Least Significant Difference (LSD), Kruskal–Wallis one-way ANOVA by ranks, Friedman two-way ANOVA by ranks, χ^2 test. Standard errors of regression coefficients, Comparing two regression lines, Pearson Product-Moment Correlation Coefficient, Spearman Rank Correlation Coefficient, Power and sampling size in correlation and regression.

Suggested Reading:

1. Gookin, D. (2007). *MS Word 2007 for Dummies*. Wiley, USA.
2. Harvey, G. (2007). *MS Excel 2007 for Dummies*. Wiley, USA.
3. Johnson, S. (2009). *Windows 7 on demand*. Perspiration Inc. USA.
4. Norman, G. and Streiner, D. (2008). *Biostatistics: The Bare Essentials*. 3/e (with SPSS). Decker Inc. USA.
5. Sokal, R.R. and Rohlf, F.J. (1994). *Biometry: The Principles and Practices of Statistics in Biological Research*. W.H. Freeman publishers, USA.
6. Thurrott, P. and Rivera, R. (2009). *Windows 7 Secrets*. Wiley, USA.

HGS.503: Biostatistics practical **Credit Hours: 1**

1. Experimental design and analysis.
2. Training on basic usage of Microsoft Word, Microsoft Excel, Microsoft PowerPoint and Internet Explorer.
3. Optimizing web search: Google advanced search, Boolean operators, Literature search using Google Scholar, HighWire.
4. Bibliography management and research paper formatting using reference software EndNote.
5. Performing statistics analyses using MS Excel Analysis toolpack.
6. Creating a functional website using HTML.
7. Basic programming using DOS batch files and Auto Hot Key.

*Practical will be conducted depending upon the faculty/facilities.

HGS.504: Cell Biology **Credit Hours: 3**

Course Objectives: Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles and their related functions.

Unit 1 **25 Lectures**

Introduction to the cell: Evolution of the cell, From molecules to first cell, From prokaryotes to eukaryotes, Prokaryotic and eukaryotic genomes, Single cell to multicellular organisms.

Membrane structure and function: Models of membrane structure, Membrane proteins, Membrane carbohydrates, Membrane transport of small molecules, Membrane transport of macromolecules and particles. Structural organization and function of intracellular organelles: The lysosomes, Ribosomes, The peroxisomes, The golgi apparatus, The endoplasmic reticulum, Mitochondria and chloroplast, Structure of mitochondria and chloroplast, Oxidation of glucose and fatty acids, Electron transport oxidative phosphorylation, Chloroplast and photosynthesis.

Unit 2 **7 Lectures**

Protein secretion and sorting: Organelle biogenesis and protein secretion, synthesis and targeting, of mitochondria, chloroplast, peroxisomal proteins, translational modification in the ER. Intracellular traffic, vesicular traffic in the secretary pathway, protein sorting in the Golgi bodies, traffic in the endocytic pathway, exocytosis.

Unit 3 **10 Lectures**

The cytoskeleton: The nature of cytoskeleton, Intermediate filaments, Microtubules, Actin filaments, Cilia and centrioles, Organization of the cytoskeleton. **Cell communication and cell signaling:** Cell adhesions, Cell junctions and the extra cellular matrix, Cell-cell adhesion and communication, Cell matrix adhesion, Collagen the fibrous protein of the matrix, Noncollagen component of the extra cellular matrix.

Unit 4 **11 Lectures**

Cell growth and division: Overview of the cell cycle and its control, The molecular mechanisms for regulating mitotic and meiotic events, Amitosis, Cell cycle control, Checkpoints in cell cycle regulation. Cell to cell signaling, Overview of the extra cellular signaling, Identification of cell surface receptors, G-protein coupled receptors and their effectors, Second messengers, Enzyme-linked cell surface receptors, Interaction and regulation of signaling pathways.

Suggested reading:

1. Alberts, B., Bray, D., Lews, J., Raff, M., Roberts, K. and Watson, J.D. (2010). *Molecular Biology of the cell*. Garland publishers, Oxford.
2. Celis, J.E. (2006). *Cell biology: A laboratory handbook*, Vol 1, 2, 3. Academic Press, UK.
3. Gupta, P.K. (2008). *Cytology, Genetics and Evolution*. Rastogi publications, Meerut, India.
4. Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. John Wiley & Sons. Inc. New Delhi, India.

HGS.505: Cell Biology – Practical **Credit Hours: 1**

1. Preparation of mitotic & meiotic chromosomes.
2. Study of structure of cell organelles through electron micrographs.
3. Instrumental methods for cell biology-centrifugation, chromatography.
4. Bacterial staining and identification.
5. Sectioning of tissues (Plant and animal).

6. Histochemical techniques (Fixing, Processing, Staining).

*Practical will be conducted depending upon the faculty/facilities.

HGS.506: Biochemistry **Credits Hours: 3**

Course Objectives: Students will understand the structures and purposes of basic components of prokaryotic and eukaryotic cells, especially macromolecules, membranes, and organelles and their related functions.

Unit 1 **15 Lectures**

Principles of biophysical chemistry pH, Buffer, Reaction kinetics, Thermodynamics, Colligative properties, Structure of atoms, Molecules and chemical bonds. Stabilizing interactions: Van der Waals, Electrostatic, Hydrogen bonding, Hydrophobic interaction, etc.

Unit 2 **14 Lectures**

Composition, structure and function of Biomolecules: Carbohydrates, Lipids, Proteins, Nucleic acids and Vitamins. Bioenergetics and metabolism of Carbohydrates, Lipids, Amino Acids and Nucleotides.

Unit 3 **10 Lectures**

Enzymology: Classification, Principles of catalysis, Mechanism of enzyme catalysis, Enzyme kinetics, Enzyme regulation, Isozymes Clinically important enzymes.

Unit 4 **15 Lectures**

Protein Chemistry: Ramachandran plot, Secondary, Tertiary and Quaternary structure, Domains, Motif and Folds. Nucleic acids: A-, B-, Z-DNA, tRNA, micro-RNA, Stability of protein and Nucleic acid structures.

Suggested Reading:

1. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2010). *Biochemistry*. W.H. Freeman & Company. USA.
2. Brown, T.A. (2006). *Gene Cloning and DNA analysis: In Introduction*. Blackwell Publishing Professional. USA.
3. Haynie, D.T. (2007). *Biological thermodynamics*. Cambridge University. UK.
4. Mathews, C.K., Van Holde, K.E. and Ahern, K.G. (2000). *Biochemistry*. Oxford University Press Inc. New York.
5. Nelson, D. and Cox, M.M. (2008). *Lehninger Principles of Biochemistry*. BI publications Pvt. Ltd. Chennai, India.
6. Ochiai, E. (2008). *Bioinorganic chemistry: A survey*. Academic Press. Elsevier, India.
7. Randall, D. J., Burggren, W. and French, K. (2001). *Eckert animal physiology*. W.H. Freeman & Company. USA.
8. Raven, P.H., Johnson, G.B. and Mason, K.A. (2007). *Biology*. Mcgraw-Hill. USA.
9. Shukla AN (2009). *Elements of enzymology*. Discovery Publishing. New Delhi, India.
10. Voet, D. and Voet, J.G. (2008). *Principles of biochemistry*. CBS Publishers & Distributors. New Delhi, India.

Centre for Human Genetics and Molecular Medicine

School of Health Sciences
Central University of Punjab, Bathinda

HGS.507: Biochemistry – Practical **Credit Hours: 1**

1. Preparation of Solutions, buffers, pH setting etc.
2. Amino acid and carbohydrate separations by paper & thin layer chromatography.
3. Quantitative Estimation of Proteins, Sugars, total lipids and amino acids.
4. Assay and estimation of different enzymes e.g. invertase, amylases, acid and alkaline phosphatases in plant seeds.
5. Principle and application of electrophoresis, Native, SDS PAGE.
6. Estimation of total phenolic compounds.
7. Extraction and estimation of vitamins.

*Practical will be conducted depending upon the faculty/facilities.

HGS.508: Genetics. **Credits Hours: 3**

Course Objectives: Course on concept of genetics would be necessary to estimate and understand origin, existence and propagation of living organisms as a whole. Basic knowledge of genetics is also necessary in application of various inheritance prediction based models for human welfare

Unit 1 **10 Lectures**

Introduction and scope of genetics, DNA as genetic material: The vehicles of inheritance, Chemical structure and base composition of nucleic acids, Double helical structure, Structure of DNA and RNA, Different types of DNA molecules, forces stabilizing nucleic acid structure, super coiled DNA, properties of DNA, denaturation and renaturation of DNA and Cot curves. **DNA replication:** Messelson and Stahl Experiment, Carins Experiment, Okazaki Experiment, Basic mechanism of DNA replication.

Unit 2 **17 Lectures**

Cell division and Cell cycle: Mitosis, Meiosis, Chromosomal basis of inheritance. Basic principles of Mendelian inheritance: Segregation and independent assortment, Alleles and multiple alleles, Human pedigrees and inheritance. Linkage analysis and gene mapping: Coupling and repulsion phase linkage, Crossing over and recombination. Population genetics: Application of Mendel's laws to populations, Hardy-Weinberg principle, inbreeding depression and heterosis, inheritance of quantitative traits.

Unit 3 **17 Lectures**

Gene Interaction: Sex determination and Sex linked inheritance, Sex determination in humans, *Drosophila* and other animals, Sex determination in plants. Sex linked genes and dosage compensation. Human genetics: pedigree analysis. Gene concept: Fine structure of gene and gene concept, Fine structure analysis – Benzer's experiments, Complementation analysis and fine structure of gene, Complementation and recombination, Concept of gene.

Unit 4 **14 Lectures**

Extra-chromosomal inheritance: Chloroplast and Mitochondrial inheritance, Yeast, *Chlamydomonas/Neurospora* and higher plants Chromosomal aberrations: Types of changes–deletions, duplications, inversions, translocations, Change in chromosome number: trisomy and

polyploidy. Evolutionary history of bread wheat, Aneuploids–nullisomics, monosomics, and trisomics, Somatic aneuploids, Changes in chromosome structure, Properties of chromosomes for detection of structural changes. Mutations: Spontaneous and induced mutations, Somatic vs germinal mutation.

Suggested Reading:

1. Anthony, J.F., Miller, J.A. ,Suzuki, D.T., Richard, R.C., Gilbert, W.M. (1998). *An introduction to Genetic Analysis*. W.H. Freeman publication, USA.
2. Atherly, A.G., Girton, J.R., Mcdonald, J.F. (1999). *The science of Genetics*. Saundern College publication.
3. Snusted, D.P., Simmons, M. J. (2010). *Principles of Genetics*. John Wiley & Sons, New York.
4. Gupta, P.K. (2009). *Genetics*. Rastogi publications, Meerut, India.
5. Gupta, P.K (2008). *Cytology, Genetics and Evolution*. Rastogi publications, Meerut, India.
6. Jocelyn, E.K., Elliott, S.G., Stephen, T.K. (2009). *Lewin's Genes X*. Jones & Bartlett Publishers, USA.
7. Schaum, W.D. (2000). *Theory & problems in Genetics by Stansfield, out line series* McGrahill, USA.
8. Tamarin, R.H. (1996). *Principles of Genetics, International edtn*. McGrawhill, USA.

HGS.509: Genetics – Practical **Credit Hours: 1**

1. Calculation of allele frequencies.
2. Calculating recessive gene frequency, Calculating frequency of sex –linked alleles.
3. Karyotyping of normal & abnormal chromosome sets.
4. Monohybrid and dihybrid ratios, Multiple alleles, Epistasis – Problems.
5. Inheritance patterns in Man – Numericals on Pedigree analysis- Autosomal patterns, X–linked patterns, Y–linked patterns.
6. Mitochondrial inheritance patterns.
7. To test PTC tasting ability in a random sample and calculate gene frequencies for the taster and non–taster alleles.
8. Identification of inactivated X chromosome as Barr body and drumstick.
9. Blood group typing using haemagglutination tests.
10. Studies of a Model organism: Identification of normal and mutant flies (Drosophila melanogaster) & Preparation of Drosophila polytene chromosomes.
11. To study fingerball and palmar dermatogylphics and calculate indices.
12. To test for colour blindness using Ishihara charts.
13. Molecular Mapping of Genes.

*Practical will be conducted depending upon the faculty/facilities.

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Elective course: Choose any one of the following

HGS.510: Human Cytogenetics and Human Biochemical Genetics **Credits Hours: 4**

Course Objectives: The basic and specialized knowledge and understanding the aspects of Cytogenetics and Biochemical genetics is essential to understand Human Genetics.

Unit 1 **18 Lectures**

Microscopy: History and principles of microscopy, Micrometry, Light microscopy, Phase Contrast, Bright Field and Dark Field microscopy, Scanning and Transmission Electron microscopy, Scanning Probe microscopy, Fluorescence microscopy, Live cell imaging, In-vivo imaging techniques.

Unit 2 **18 Lectures**

General features of Human Chromosome and Chromosome staining: Chromatin structure, Constitutive and Facultative Heterochromatin, Centromeres, Telomere and its maintenance, Nuclear Organization Region (NOR), Sister Chromatid Exchanges (SCE), Mosaicism, Structure of Human X and Y chromosome, Chromosome Banding Techniques, Human Artificial Chromosome.

Dosage compensation and In Situ Hybridization: Sex determination and dosage compensation in *Caenorhabditis, Drosophila* and mammals, Fluorescent in situ hybridization (FISH), Comparative Genomic Hybridization (CGH) mapping technique, Whole Chromosome Painting.

Unit 3 **18 Lectures**

The concept of Biochemical Polymorphism: enzyme and protein polymorphisms; Effects of multiple gene loci on protein structure, Molecular structure, biosynthesis and genetics of the ABH antigens, Rh antigens and MN antigens.

Normal Biochemical Polymorphisms and Variants: Quantitative and qualitative variation of enzymes, Haemoglobin variants, Effects of Single Amino Acid Substitutions i.e. Sickle cell disease, unstable haemoglobins, Genetics of steroid and insulin receptors.

Unit 4 **18 Lectures**

Disorders due to Abnormal Variants of lysosomal enzymes, lipids and DNA nitrogenous bases: Disorders of Lysosomal enzymes–Tay- Sachs disease and Mucopolysaccharidoses, Disorders of Lipoprotein and lipid metabolism – Hyper Lipoproteinemia; Disorders of Purine metabolism- Lesch Nyhan syndrome; Disorders of Pyrmidine metabolism – Orotic Aciduria

Suggested readings:

1. Gillham, N. (2011). *Genes, Chromosomes and Disease*. Pearson
2. Griffiths, A.J.F., Wessler, S.R. and Carroll, S.B. (2012). *An Introduction to Genetic Analysis*. W.H. Freeman Publication, USA.
3. Hein, S. and Mitelman, F. (2009). *Cancer Cytogenetics*. Wiley-Blackwell.
4. Klug, W.S., Cummings, M.R., Spencer, C.A. and Palladino, M.A. (2012). *Concepts of Genetics*. Pearson.
5. Korf, B.R and Irons, M.B. (2013). *Human Genetics and Genomics*. Wiley-Blackwell.
6. Kumar, A. and Srivastava, M. (2012) A textbook of Molecular Cytogentics, Narendra Publishing House, India
7. Purandare, H. and Chakravarty, A. (2000) *Human Cytogenetic Techniques and Clinical Applications*. Bhalani Publishing House, Mumbai, India.

8. Ram, M. (2010). *Fundamental of Cytogenetics and Genetics*. PHI Learning Pvt. Ltd.
9. Roy, D. (2009). *Cytogenetics*. Narosa Publishing House. New Delhi, India.
10. Tom, S and Read, A (2010). *Human Molecular Genetics*. Garland Science.
11. Shukla, A.N. (2009). *Elements of enzymology*. Discovery Publishing. New Delhi, India.
12. Voet, D. and Voet, J.G. (2008). *Principles of Biochemistry*. CBS Publishers & Distributors, New Delhi.
13. . Murray, R.K., Bender, D.,Botham, K., M.,Kennelly, P. J., Rodwell, V. W. and Weil, P.A. (2012). *Harpers Illustrated Biochemistry*. McGraw-Hill Medical.
14. Nelson, D. and Cox, M.M. (2013). *Lehninger Principles of Biochemistry*. W.H. Freeman.

HGS.511: Human Cytogenetics and Human Biochemical Genetics. Credit Hours: 1.

1. Cell counting by using hemocytometer.
2. Calculation of cell doubling time.
3. Human lymphocyte culture.
4. Karyotyping of normal and abnormal chromosome sets.
5. Identification of inactivated X chromosome as Barr body and drumstick.
6. Chromosome banding.
7. FISH
8. Sickling Test
9. Separation of abnormal Haemoglobins
10. Estimation of Hb A2
11. Red Cell Enzymes – ACP, ESD
12. Plasma proteins – HP, CP

*Practical will be conducted depending upon the faculty/facilities.

LMM.510: Concepts and Prospects of Molecular Medicine. **Credits Hours: 5**

Course Objective: The students will understand the background of molecular medicine i.e. molecular/cell biology relevant to medical applications. It will enhance their understanding how normal cellular processes change, fail or are destroyed by disease development, in particular for genetic diseases and role of modern therapeutics.

Unit: 1 **18 Lectures**

Molecular basis of diseases: Human genetics relevant to molecular medicine, single nucleotide polymorphisms, multiple gene polymorphisms, single and multi-gene diseases, gene-environment interactions in disease manifestation.

Unit: 2 **18 Lectures**

Molecular medicine therapeutics: Gene therapy and recombinant molecules in medicine and therapeutic development, Antiviral therapies, vehicles for gene therapies, pharmacogenomics, its application and role in developing novel therapies. RNAi and human diseases, alternate splicing and human disease.

Unit: 3 **18 Lectures**

Signal transduction and its role in human diseases: Cellular and tissue microenvironment in diseases, drug resistance with convention chemotherapies, construction of knock-out and transgenic animals, Protein as causes of human diseases.

Unit: 4 **18 Lectures**

Clinical trials, adjuvant therapies, monoclonal antibodies as drugs, nanobiotechnology and its applications in molecular medicine, next generation sequencing techniques.

Suggested Reading:

1. Littwack, G. (2008). *Human Biochemistry and Disease*. Academic Press.
2. Trent, R. J. (2012). *Molecular Medicine*, Fourth Edition: Genomics to Personalized Healthcare. Academic Press.
3. Trent, R. J. (2005). *Molecular Medicine: An Introductory Text*. Academic Press.
4. Elles, R., Mountfield, R. (2011). *Molecular Diagnosis of Genetic Diseases*. Springer Publication.
5. Liciniio, J., Wong, M. L. (2003). *Pharmacogenomics: The Search for Individualized Therapies*. Wiley-VCH Verlag GmbH & Co. KGaA.
6. Audet, J., Stanford, W. and Stanford,W. L. (2009) *Stem cells in regenerative medicine*. New York, Humana press.

Interdisciplinary courses offered to students of other centre

HGS.512 Basics of Human Genetics **Credits Hours: 2**

Course Objective: The course gives a overview of basics of Human Genetics and makes familiar with the common genetic disorders.

Unit 1 **18 Lectures**

Chromosomal analysis and Genetic assessment: Classification of Genetic Disorders, Human Chromosomes, The Life Cycle of a Somatic Cell, Mitosis, Meiosis, Medical Applications of Chromosomes, Drawing of a pedigree,consanguinity.

Unit 2 **18 Lectures**

Common chromosomal disorders and Mendelian disorders: Down syndrome, Edwards syndrome, Patau's syndrome and other trisomies, Structural aberrations, Single gene disorders: autosomal and sex chromosomal, Multifactorial disorders.

Suggested Reading:

1. Emery and Rimoin's, et al., 2007. Principles and Practice of Medical Genetics. Fifth Edition.Volume - II, Churchill Livingstone Elsevier.
2. Emery and Rimoin's, Principles and Practice of Medical Genetics e-dition: 3-Volume.Set, Churchill Livingstone Elsevier
3. De Grouchy & Turleau.1984. Clinical atlas on Human Chromosomes.
4. Jankowski & Polak, 1996.*Clinical Gene Analysis and Manipulation.*
5. Robinson and Linden, Clinical Genetics Handbook. (latest edition)
6. F Vogel A.G. Motulusky. Human Genetics: Problems and Approaches. Second Completely Revised Edition, Springer-Verlag. (latest edition)
7. Golder N. Wilson, M.D., Ph.D.Clinical Genetics-A Short Course. A John Wiley and Sons, Inc., Publication. (latest edition)

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HGS.513 Basics of Microscopic Techniques **Credits Hours: 2**

Course Objectives: Microscopes are an important and essential instrument in a Laboratory. The course aims to provide basic understanding of the working of a microscope.

Unit: 1 **18 Lectures**

Basic concepts of microscopy: Magnification; Resolution and resolving powers of different microscope; Field number; Identification of parts of light microscope; visualization of cells and subcellular components by light microscopy, microscopy of living cells; image processing methods in microscopy.

Unit: 2 **18 Lectures**

Principles of Fluorescence and Fluorescence Microscopy

Electron microscopy: Scanning and Transmission electron microscope. Different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM.

Suggested Reading:

1. Suzanne Bell and Keith Morris (2009). *An Introduction to Microscopy.* CRC Press., Boca Raton, FL 33487, USA
2. Kiernan J.A., I. Mason (2002). *Microscopy and Histology for Molecular Biologists: A User's Guide.* Portland Press.
3. A. Méndez-Vilas (2009). *Microscopy: advances in scientific research and education.* Formatex Research Center
4. A. Mendez-Vilas (2012). *Current microscopy contributions to advances in science and technology.* Formatex Research Center.
5. Prakash Singh Bisen and Anjana Sharma (2012). *Introduction to Instrumentation in Life Sciences.* CRC Press taylor and francis
6. Rafael Yuste (2011). *Imaging: A Laboratory Manual.* Cold spring Harbor Laboratory Press

HGS.514 Concepts of Immunogenetics **Credits Hours:2**

Course Objectives: This course is of interest as most of the recent lifestyle related and inherited diseases are immune mediated. Knowledge of Immunogenetics will improve the understanding of the genetics focused to immune mediated traits. Study of this course will update student's concepts about regulation of immune responses and built basis for interdisciplinary idea for translational research.

Unit: 1 **18 Lectures**

Introduction to Immunogenetics: Overview of human immune system: Types of immune system, component of immune system, immune cells and organs; HLA and non-HLA genes; Tissue specificity and expression pattern of immune genes, T-cell and B-cell mediated immune response, autoimmunity and tissue inflammation, immune genes and common complex diseases:

Rheumatoid arthritis, Celiac disease, Inflammatory bowel diseases, Psoriasis, Multiple sclerosis, immune diseases and gut microbiota.

Unit: 2 **18 Lectures**

Diagnosis, Treatment and management: Basic diagnosis methods; Basic treatment regime; pharmacogenomics of common drugs; concept of modern therapy: pre-prescription screening, community medicine and personalized medicine;Disease management and rehabilitation.

Suggested readings:

1. Strachan T & Read A (2010): Human Molecular Genetics, 4th Edition (Garland Science)
2. Korf B & Irons M (2012): Human Genetics and Genomics, 4th Edition (Wiley-Blackwell)
3. Gangane S.D (2012): Human Genetics, 4th Edition (Elsevier)
4. Haines J.L &Pericak-Vance MA (2006) : Genetic analysis of complex disease, 2nd Edition (Wiley-Liss)
5. Dang HW, Shen H & Liu Y (2007): Current topics in Human Genetics, 1st Edition (World Scientific Publishing Co.)

HGS.515: Gene, Genome and Genomics **Credits Hours: 2**

Course Objective: Understanding the complexity of human genome will provide information to the students that how human system works at molecular level. It will be helpful in understanding the molecular mechanism at system level and how the body functions in health and illness.

Unit: 1 **18 Lectures**

Genes & Genomes: DNA as genetic material, Double helical structure and semiconservative nature of DNA, Prokaryotic and eukaryotic genomes, Organelle genomes, Organisation of genomes, Chromatin, Chromosomes, Polytene chromosomes, Telomeres, DNA replication, Exons & introns, Transcription, Reverse transcription, Splicing, Translation, Regulation of gene expression.

Unit: 2 **18 Lectures**

Genomics: Genetics engineering, Sequencing and mapping of genomes, Human Genome Project, Human genome variations, High throughput sequencing technologies and their implications, Functional and translational genomics, Pharmacogenomics and personalized medicine.

Suggested Readings:

1. Jeremy W. Dale, Malcolm von Schantz (2002). From Genes to Genomes: Concepts and Applications of DNA Technology. John Wiley & sons Ltd. UK
2. Alberts, B., Bray, D., Lews, J., Raff, M., Roberts, K. and Watson, J.D. (2010). *Molecular Biology of the cell.* Garland publishers, Oxford.
3. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2010). *Biochemistry.* W.H. Freeman & Company. USA.
4. Nelson, D. and Cox, M.M. (2008). *Lehninger Principles of Biochemistry.* BI publications Pvt. Ltd. Chennai, India.
5. Snusted, D.P., Simmons, M. J. (2010). *Principles of Genetics.* John Wiley & Sons, New York.

6. Jocelyn, E.K., Elliott, S.G., Stephen, T.K. (2009). *Lewin's Genes X*. Jones & Bartlett Publishers, USA.

Semester II

S.No	Paper Code	Course Title	L	T	P	Cr
		Core courses				
1	HGS.521	Human Physiology	3	-	-	3
2	HGS.522	Human Physiology (P)	-	-	1	1
3	HGS.523	Essentials of Immunology	2	-	-	2
4	HGS.524	Human Embryology and Developmental Genetics	4	-	-	4
5	HGS.525	Advanced Techniques in Human Genetics and Molecular Medicine	3	-	-	3
6	HGS.599	Seminar	-	-	1	1
		Foundation course				
7	HGS.526	Molecular Biology	3	-	-	3
8	HGS.527	Molecular Biology (P)	-	-	1	1
		Elective courses (choose any one)				
9	HGS.528	Population Genetics and Genetic Epidemiology	4	-	-	4
10	LMM.551	Cancer Biology	4	-	-	4
		Elective course (interdisciplinary)				
11	XXX	Interdisciplinary Course-1	?			?
		Total				**24**
Interdisciplinary courses offered to students of other centre						
12	HGS.529	Prenatal Diagnosis and Genetic Counseling	2	-	-	2
13	HGS.530	Introduction with Population Genetics	2	-	-	2
14	HGS.531	Genetic Epidemiology	2	-	-	2
15	HGS.532	Aging and associated diseases	2	-	-	2

L: Lectures, T: Tutorial, P: Practical, Cr: Credit

HGS.521: Human Physiology **Credit Hours: 3**

Unit: 1 **17 Lectures**

Digestive system: Digestion, absorption, energy balance, BMR.
Epithelial Barrier Function, Regulation of Swallowing and Gastric Emptying and Small/ Large Bowel. Gastro-intestinal Secretions and accessory glands

Respiratory system: Anatomical considerations, Transport of gases, Exchange of gases, Waste elimination, Neural and chemical regulation of respiration. Alveolar Ventilation, Diffusion Across Alveoli. Transport of Respiratory Gases in Blood. The Respiratory System Under Stress: Altitude, Hypoxia

Excretory system: Comparative physiology of excretion. Kidney, Urine formation, Urine

concentration, Waste elimination, Micturition, Regulation of water balance, Blood Volume, Blood pressure, Electrolyte balance, Acid-base balance. Renal Function and Hemodynamics

Unit: 2 **17 Lectures**

Muscle Physiology: Types of muscles, Properties; Contractile force; Motor Unit. Skeletal, cardiac and smooth Muscle Mechanics & Metabolism.Control of Body Movement.

Cardiovascular system: Comparative anatomy of heart structure, Myogenic heart, specialized tissue, ECG – its principle and significance, Cardiac cycle, Heart as a pump, blood pressure, neural and chemical regulation of all above, Blood corpuscles, Blood cell synthesis and Bone marrow, Haemopoiesis and formed elements, Plasma function, Blood volume, Blood volume and its regulation, Blood groups, Haemoglobin, Immunity, Haemostasis.

Unit: 3 **12 Lectures**

Nervous system: Neurons, action potential, Gross neuroanatomy of the brain and spinal cord, Central and peripheral nervous system, Neural control of muscle tone and posture.

Sense organs: Vision, hearing and tactile response.

Thermoregulation and stress adaptation: Comfort zone, Body temperature – physical, chemical, Neural regulation, Acclimatization

Unit: 4 **8 Lectures**

Endocrinology: Endocrine glands, Hormone Structure and Function, Basic mechanism of hormone action, Hormones and diseases, Reproductive processes, Neuroendocrine regulation. Hormone Receptors and Intracellular Signaling.

Suggested readings:

1. Brody, T. (1998). *Nutritional biochemistry*. Academic Press, USA.
2. Devlin, T.M. (2005). *Textbook of Biochemistry with clinical correlations*. John Wiley & Sons Inc. USA.
3. Guyton. (2007). *Textbook of medical physiology*. 11th Edition. Elsevier India Pvt. Ltd. New Delhi.
4. Hill, R.W, Wyse, G. A. and Anderson, M. (2008). *Animal physiology*. Sinauer Associates Inc. USA.
5. Khurana. (2006). *Textbook of medical physiology*. Elsevier India Pvt. Ltd.
6. Murray, R.K. (2009). *Harper's illustrated biochemistry*. Jaypee Publishers, New Delhi, India.
7. Tyagi, P. (2009). *A textbook of Animal Physiology*. Dominant Publishers and distributors, New Delhi, India.
8. Silverthorn D, (2011) *Human Physiology*, Pearson; 6th edition.
9. Sherman V. (2013) *Vander's Human Physiology*. McGraw-Hill 13th edition.

HGS.522: Human Physiology – Practical **Credit Hours: 1**

1. Determination of hemoglobin in the blood by various methods.
2. Measurement of Blood Pressure, Pulse rate and Heart rate.
3. Digestive enzymes analysis.
4. Respiratory function: Tidal volume.
5. Sense organs and muscle reflexes.

6. Urine analysis.
7. Blood glucose estimation.
8. RBC, WBC count from human blood.
9. Extraction and estimation of acid phosphatases from serum.
10. Electrophoresis of egg proteins.

*Practical will be conducted depending upon the faculty/facilities.

HGS.523 : Essentials of Immunology **Credit Hours:2**

Unit: 1 **9 Lectures**

Immune system: Cells and organs of the immune system. Humoral and cellular components of the immune system, Innate & adaptive immunity, Antigens, antigenicity vs immunogenicity. Antigen processing and presentation, Structure, function, classes and subclasses of immunoglobulins, MHC, Primary and secondary immune response.

Unit: 2 **9 Lectures**

Immune Effectors: Complement system, their structure, functions and mechanisms of activation by classical, alternative and lectin pathway. Th1 and Th2 response, cytokines, Chemokines. Antigen and antibody interactions.

Unit: 3 **9 Lectures**

Mechanisms of Immune System Diversity: Organization and expression of immunoglobulin genes, Mechanisms of antibody diversity, class switching. Structure and functions of Major Histocompatibility Complex (MHC) and Human Leukocyte Antigen (HLA) system, polymorphism, distribution, variation and their functions. Organization and rearrangement of T-cell receptor genes (TCR).

Unit: 4 **9 Lectures**

Immune System in Health and Diseases: Inflammation, hypersensitivity and autoimmunity, Immunity to microbes, immunity to tumors, AIDS and immunodeficiencies, hybridoma technology and vaccine development for diseases like AIDS, cancer and malaria. Production, characterization and applications of monoclonal antibodies in diagnosis, therapy and basic research, concept of making immunotoxins.

Suggested Reading:

1. Kindt, T.J., Osborne, B.A. and Goldsby, R.A. (2007). *Kuby Immunology* .7th Edition. W.H. Freeman, USA.
2. Abbas. (2008). *Cellular and Molecular immunology.* CBS Publishers & Distributors, India.
3. Charles, A. and Janeway, J.R. (1994). *Immunobiology: The immune system in health and disease.* Blackwell Publishing, USA.
4. Delves, P.J., Roitt, I.M. and Seamus, J.M. (2006). *Roitt's essential immunology (Series–Essentials).* Blackwell Publishers, USA.
5. Elgert, K.D. (2009). *Immunology: Understanding the immune system.* Wiley-Blackwell, USA.
6. Paul, W.E. (1993). *Fundamental immunology.* Raven Press, SD, USA.

7. Sawhney, S.K. and Randhir, S. (2005). *Introductory practical biochemistry*. Alpha Science International Ltd. New Delhi, India.
8. Tizard. (2008). *Immunology: An Introduction*. Cengage Learning, Thompson, USA.

HGS.524: Human Embryology and Developmental Genetics **Credit Hours: 4**

Unit: 1 **18 Lectures**

Reproductive Physiology: Structure and Functions of Adult Human Reproductive organs, Reproductive Endocrinology, Gametogenesis: Formation of male and female gametes, Embryogenesis: Fertilization, Gastrulation and Implantation of Embryo, Lactation.

Unit: 2 **18 Lectures**

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

Unit: 3 **18 Lectures**

Regulation of Organ Development: Genetic and molecular control of development of limbs, Gastrointestinal system and cardiovascular system; Genetics of sex determination in humans and development of Urogenital system; Programmed cell death and role of cell death in formation of digits and joints, Genetic and molecular control of development of head and neck region, Differentiation of Neurons.

Unit: 4 **18 Lectures**

Post-natal Development, Aging and senescence: Environmental and genetic factors during maturations, Sex linked changes, Deciduous *and* primary teeth, Cognitive development ageing: its causes and regulation; Clinical death.

Suggested reading:

1. Green, D. R. & Reed J. C. (2010). *Apoptosis: Physiology and Pathology*. Cambridge press, UK.
2. Milunsky, J. & Milunsky, A. (2010). *Genetic Disorders and the Fetus: Diagnosis, Prevention & Treatment*. Willey Blackwell India, New Delhi.
3. Nussbaun, R., Roderick, R. M. and Huntington, F.W.(2007). *Genetics in Medicine*. Saunders Elsevier Philadelphia.
4. Prakash, G. (2007). *Reproductive Biology*. Narosa Publication House Pvt. Ltd., New Delhi.
5. Sadler, T.W., Tosney, K., Chescheir, N.,C., Imseis, H.,Leland, J. and Sadler-Redmond, S.,L. (2011). *Langman's Medical Embryology (Longmans Medical Embryolgy)*. Lippincott Williams and Wilkins.
6. Schaefer, B.*D. (2013). Medical Genetics: An integrated Approach*. McGraw Hill Education, New Delhi.
7. Tyagi R. (2011). *Understanding Evolutionary Biology*. Discovery Publication House Pvt. Ltd., New Delhi.

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HGS.525 Advanced Techniques in Human Genetics and Molecular Medicine

Credit Hours: 3

Unit 1 9 Lectures

Biophysical Techniques. Sterilization techniques, Spectrometry: Colorimetry, mass, UV, IR, NMR and atomic absorption spectrophotometery, Centrifugation: Principle and applications, Ultracentrifugation. Chromatography: Principle, procedure and applications of thin layer chromatography (TLC), gel filtration and ion exchange, affinity chromatography, GC, GLC, HPLC and FPLC.

Unit: 2 9 Lectures

Microscopy: Light microscopy, phase contrast microscopy, fluorescent microscopy, scanning electron microscopy (SEM/FESEM), transmission electron microscopy (TEM), micrometry and photomicrography, Histochemistry, Scanning-probe microscopy, Atomic force microscopy, CLSM.

Unit: 3 9 Lectures

Nucleic acids: Isolation, purification and analysis of nucleic acids. Electrophoresis: Principle of gel electrophoresis, polyacrylamide gel electrophoresis (PAGE and SDS-PAGE), agarose gel electrophoresis, pulse field gel electrophoresis (PFGE) and 2-Dimensional gel electrophoresis. Polymerase chain reaction (PCR): Principle, types and applications, PCR based markers: RAPDs, SSRs, SNPs, ISSRs, and SCARs etc. Blotting techniques: Southern, Northern, Western, Dot blotting and hybridization, DNA fingerprinting.

Unit: 4 9 Lectures

Flow cytometry: Cell sorting, Hybridoma technology/Production of antibodies, Histochemical and Immunotechniques, Immunochemical Techniques, Developing Monoclonal and Polyclonal antibodies, Immunocytochemistry, Radioimmunoassay (RIA), Enzyme Linked Immunosorbent Assay (ELISA) and Autoradiography. **Mutation Analyses Techniques:** Restriction mapping, SSCP analyses, DNA sequencing-manual and automated methods. **Cell and tissue culture techniques:** Plants and animals.

Suggested Reading:

1. Brown, T.A. (2010). *Gene cloning and DNA analysis: An Introduction*. 6th Edition, Wiley-Blackwell Publisher, New York.
2. Goldsby, R.A., Kindt, T.I. and Osborne, B.A. (2008). *Kuby Immunology*. 6th Edition, W. H. Freeman & Company, San Francisco.
3. Gupta, P.K. (2005). *Elements of biotechnology*. Rastogi Publications, Meerut.
4. Gupta, S. (2005). *Research methodology and statistical techniques*, Deep & Deep Publications (P) Ltd. New Delhi.
5. Kothari, C.R. (2008.) *Research methodology(s)*. New Age International (P) Ltd., New Delhi
6. Lewin, B. (2010). *Genes X*, CBS Publishers & Distributors. New Delhi.

7. Mangal, S.K. (2007). *DNA Markers In Plant Improvement*. Daya Publishing House,New Delhi.
8. Nelson, D. and Cox, M.M. (2009). *Lehninger Principles of Biochemistry*. W.H. Freeman and Company, New York.
9. Primrose. S.B. and Twyman, R. (2006). *Principles of Gene Manipulation and Genomics*. Blackwell Publishing Professional, U.K.
10. Sambrook, J. (2006). *The Condensed Protocols from Molecular Cloning: A Laboratory Manual*. Cshl Press. New York.
11. Sambrook, J. and Russell, D.W. (2000). *Molecular Cloning: A Laboratory Manual* (3 Vol-set). 3rd Edition, CSHL Press, New York.
12. Sawhney, S.K. and Singh, R. (2005). *Introductory Practical Biochemistry*. Narosa Publishing House, New Delhi .
13. Slater, A., Scott, N.W. and Fowler, M.R. (2008). *Plant Biotechnology: The Genetic Manipulation of Plants*. Oxford University Press, USA.
14. Wilson, K. and Walker, J. (2006). *Principles and Techniques of Biochemistry and Molecular biology*. 6th Edition, Cambridge University Press India Pvt. Ltd., New Delhi.

HGS.559: Seminar **Credit Hours: 1**

HGS.526: Molecular Biology **Credit Hours: 3**

Unit: 1 **14 Lectures**

Structure, Conformation, Denaturation, Renaturation of Nucleic acids: Carrier of genetic information, Chemical structure of DNA and base composition, Watson-Crick model, Supercoiled DNA, Different forms of RNA: mRNA, tRNA, rRNA and other Types of RNA. Organelle DNA: mitochondria and chloroplast DNA. Chromosome Structure, Chromatin and the Nucleosome: Genome Sequence and Chromosome Diversity, Chromosome Duplication and segregation, The nucleosome, Chromatin structure: euchromatin, heterochromatin, Constitutive and facultative heterochromatin, Regulation of chromatin structure and nucleosome assembly, Nucleolus.

Unit: 2 **14 Lectures**

Gene & Genome organization: Split genes, Overlapping genes, Transposons & retrotransposons, Gene clusters, Histones, Non-histones, Nucleosome, Chromatin, Chromosome structure in prokaryotes & eukaryotes. Basic Processes, Replication of DNA: Prokaryotic and eukaryotic DNA replication, Mechanism of DNA replication, Enzymes and accessory proteins involved in DNA replication, Replication errors, DNA damage and their repair.

Unit: 3 **14 Lectures**

Transcription and mRNA processing: Prokaryotic &, eukaryotic transcription, general and specific transcription factors, Regulatory elements and mechanisms of transcription regulation, Transcriptional and posttranscriptional gene silencing: Initiation, Elongation & Termination of transcription, Capping, Polyadenylation, Splicing, editing, mRNA stability, RNA interference, Microarray.

Unit: 4 **12 Lectures**

Translation: Genetic code, Prokaryotic & eukaryotic translation, the translation machinery, mechanisms of chain initiation, elongation and termination, regulation of translation, co-and post- translational modifications of proteins, Epigenetics.

Suggested Reading:

1. Fasman, G.D. (1989). *Practical Handbook of Biochemistry and Molecular Biology*. CRC Press, Taylor and Francis Group, UK.
2. Gupta, P.K. (2005). *Cell and Molecular Biology*. Rastogi publications, Meerut, India.
3. James, D.W., Baker, T.A., Bell, S.P., Gann, A. (2009). *Molecular Biology of the Gene*. Benjamin Cummings, USA.
4. Jocelyn, E.K., Elliott, S.G., Stephen, T.K. (2009). *Lewin's Genes X*. Jones & Bartlett Publishers, USA.
5. Johnson, A., Lewis, J., Raff, M. (2007). *Molecular Biology of the Cell*. Garland Science, USA.
6. Lodish, H., Berk, A., Chris, A.K. and Krieger, M. (2008). *Molecular Cell Biology*. W.H. Freeman, USA.
7. Sambrook, J., Fritish, E.F., Maniatis, T. (2000). *Molecular cloning: A laboratory manual*. Cold Spring Harbor Laboratory Press, New York.

HGS.527: Molecular Biology- Practical **Credit Hours: 1**

1. Isolation of genomic DNA from bacteria (E.coli) and human blood, Quantification of DNA using spectrophotometric method.
2. RNA isolation.
3. cDNA synthesis.
4. RT-PCR.
5. Isolation of plasmid DNA from bacteria.
6. Transformation of bacteria using CaCl2 heat shock method-Competent cell preparation.
7. Digestion of DNA using restriction endonucleases, Resolution and molecular weight estimation of fragmented DNA using agarose gel electrophoresis.
8. Construction of restriction map by single and double digestion, Designing DNA probe, Southern blot hybridization (demonstration only).
9. 1Amplification of known DNA sequences by Polymerase Chain Reaction.

*Practical will be conducted depending upon the faculty/facilities.

Opt any one course from the following Elective courses

HGS.528 Population Genetics and Genetic Epidemiology **Credit Hours: 3**

Course Objectives:

Study of population genetics is necessary to understand the evolution. This course will be helpful to the students to conceptualize the existence of genetic variation and speciation. Further, this

course will give students exposure towards understanding population health and disease susceptibility.

Unit 1 **18 Lectures**

Population dynamics and Fundamental of Epidemiology: Dynamics and conditions of the Hardy-Weinberg law; Selection coefficient and fitness; Heterozygous advantages, Inbreeding and its consequences; Mutation pressure and estimation of rates, Genetic load, Selection coefficient and Fitness, Dynamics of migration and genetic drifts; Construction of Pedigree and Pedigree analysis.

Unit: 2 **12 Lectures**

Introduction of different types of epidemiological studies: Experimental and observational; Cohort studies; Association studies, genome-wide association studies (GWAS), general approaches to access the genetic basis of disease; heritability; basic parameters of epidemiology: frequency, occurrence, prevalence, Incidence; Association; variation;

Unit: 3 **12 Lectures**

Population and speciation: Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; convergent evolution; sexual selection; co-evolution.

Unit: 4 **12 Lectures**

Genetic variation and Inheritance of complex traits: Basics of genetic variation, Genetic markers – SNP, CNV, Indels, VNTR, STR, Microsatellite. Tag markers and Haplotypes, Linkage disequilibrium, Fixation index; Quantitative Genetic analysis; Broad-Sense Heritability and Narrow Sense Heritability.

Suggested reading:

1. Bhasker, H.V. and Kumar S (2008). *Genetics*. Campus Books International, New Delhi, India.
2. Cavalli-Sforza, L.L. and Bodmer, W.F. (2013). *The Genetics of Human Populations*. Dover Publications.
3. Hamilton M.B. (2009). *Population Genetics*. Wiley-Blackwell, UK.
4. Hedrick P.W.(2011). *Genetics of Populations*. Jones and Bartlett Publishers, Massachusetts.
5. Jobling, M., Hollox, E., Hurles, M., Kivisild, T. and Tyler-Smith, C. (2013). *Human Evolutionary Genetics*. Garland Science.
6. Knight, J.C. (2009). *Human Genetic Diversity –Functional consequences for Health and Disease*. Oxford University Press, USA.
7. Krebs, J.E, Goldstein, E.S. and Kilpatrick, S.T. (2013) *Lewin's Essential Genes*. Jones and Bartlett learning, USA.
8. Nielsen, R. and Slatkin, M. (2013). An Introduction to Population Genetics: Theory and Applications. Sinauer Associates, Inc.
9. Relethford, J.H. (2012). *Human Population Genetics*. John Wiley & Sons.
10. Snusted, D.P., Simmons, M. J. (2010). *Principles of Genetics*. John Wiley & Sons, New York.

11. Palmer LJ, Burton PR & Smith GD (2011). *An introduction to genetic epidemiology* (Policy Press, University of Bristol)
12. Dawn TM (2011). *Genetic Epidemiology* (Springer)
13. Austin M (2013). *Genetic Epidemiology: Methods and Applications*, 1st Edition (CABI Publishing)

LMM.551: Cancer Biology **Credit Hours: 4**

Course Objectives: Cancer Biology course is designed as an elective course to equip the students of different streams of Life Sciences with a conceptual understanding and advanced comprehension to cope up with the ever-expanding role of molecular biology in basic cancer research as well as clinical oncology.

Unit: 1 **18 Lectures**

Fundamentals and Genetics of Cancer: History, hallmarks of cancer research, cancer classification, Mutagens, carcinogens and gene mutations and genetic arrangements in progenitor cells. Chromosomal aberrations, tumor viruses and discovery of oncogenes, Mechanism of activation of oncogenes. Transcription factors as tumor suppressors and oncogenes, Familial cancer syndromes, telomere regulation in cancer, micro RNA profiling in cancer, cancer stem cells.

Unit: 2 **18 Lectures**

Signal transduction in cancer progression: Role of growth factors and receptors in carcinogenesis, Interaction of cancer cells with variety of immune cells. Deregulation of Cell cycle in cancer. Role of p53 and pRb in cell cycle, Apoptosis and tumor suppressor p53, mitochondrial signaling, RAS signaling in cancer, cancer metabolism, hypoxia and metastasis, angiogenesis, tumor microenvironment. DNA damage and repair mechanisms, DNA repair defects and their relation to cancer.

Unit: 3 **18 Lectures**

Cancer Detection: General and organ specific symptoms associated with cancer, techniques for cancer detection, biomarkers for cancer detection of various stages of cancer, population genetics based screening methods, *In-vitro* assays to detect angiogenesis, metastasis, cell proliferation, mice models to study cancer (transgenic, knock-out, knock-in, xenografts and patient derived xenografts), genomic and proteomic approaches to develop better cancer markers.

Unit: 4 **18 Lectures**

Cancer Therapies and Recent Advances in Cancer Research : Traditional Chemotherapies, radiotherapy, Onco-surgery, Bone marrow transplantation, stem cell therapies, Immunotherapy, combinational therapies, natural products as therapeutics, cancer vaccines, gene therapies and delivery vehicles, targeted anticancer therapies, monoclonal antibody & adjuvant therapies. System biology approaches, Application of new technologies in prevention, assessing risk, diagnostics and treatment.

Suggested Reading:

1. Airley, R. (2010). *Cancer Chemotherapy: basics to clinic*. Willey-Blackwell publishing, New Jersey.

2. DeVita, V. T., Hellman, S., Rosenberg, S. A. (2011). *Cancer: principles and practice of oncology*. Lippincot Williams and Wilkins publishers, Philadelphia.
3. Enders, G. H. (2010). Cell *cycle deregulation in cancer*. Humana Press, Springer science, New York.
4. Grutzmann, R., Pilarsky, C. (2010). *Cancer gene profiling: methods and protocols*. Humana Press, Springer science, New York.
5. Gusev, Y. (2010). *Micro RNA profiling in cancer*. Pan Standford publishing pvt.Ltd., Singapore.
6. Hiem, S., Mitelman, F. (2009). *Cancer cytogenetics*. IIIrd edition. Willey-Blackwell publishing, New Jersey.
7. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009). *Lewin's Gene X*. Jones &Barlett.
8. Wang, E. (2010). *Cancer systems biology*. CRC press, Taylor & Francis group, New York.
9. Weinberg, Robert A. (2007). *The Biology of Cancer*. New York: Garland Science
10. Prasad, K. N. (2009). Bio-Shield, *Antioxidants against Radiological, Chemical and Biological Weapons,* Strategic Book Publishing, USA.
11. Washington, C. M. and Leaver D. T. (2009). *Principles and Practice of Radiation Therapy*, Elsevier Health Sciences, USA.

Interdisciplinary Courses (courses offered to students of other centers)

HGS.529 Prenatal Diagnosis and Genetic Counseling **Credit Hours: 2**

Unit-1 **14 Lectures**

Genetic Counseling: History taking, Examination, Genetic Counseling in Clinical Genetics, Determining Recurrence Risks, Population Screening for Genetic Diseases, Reproductive decision making

Unit-2 **14 Lectures**

Prenatal Diagnosis: Indications for Prenatal Diagnosis, Preliminaries to Prenatal Diagnosis, Procedures for Obtaining Fetal Tissue, Ultrasonography, Laboratory Studies, Psychosocial issues.

Suggested readings:

1. Peter Snustad and Michael J Simmons(2009). Principles of Human Genetics. Fifth Edition. John Wiley & Sons, Inc.
2. Strachan T and Read A 2010 Human Molecular Genetics, Fourth Edition. Taylor and Francis
3. Ricki Lewis (2009) Human Genetics-Concepts and Application. Ninth Edition. McGraw-Hill College Publishers

HGS.530 Introduction with Population Genetics Credit Hours: 2

Unit-I 18 Lectures

Hardy-Weinberg Equilibrium: Historical emergence, Application and subdivisions of human population genetics, Dynamics and conditions of the Hardy-Weinberg law and its application for autosomal locus with two alleles and multiple alleles, Testing of Hardy-Weinberg proportion, Selection coefficient and fitness, Heterozygous advantages, Inbreeding and its consequences.

Unit-II 18 Lectures

Kinetics of changes of Gene Frequencies: Non-recurrent and recurrent mutation. mutation pressure and estimation of rates, Genetic load, Selection coefficient and fitness, Heterozygous advantages, Equilibrium between mutation and selection, Dynamics of migration and genetic drifts

Suggested readings:

1. Bhasker, H.V. and Kumar S (2008). *Genetics*. Campus Books International, New Delhi, India.
2. Cavalli-Sforza, L.L. and Bodmer, W.F. (2013). *The Genetics of Human Populations*. Dover Publications.
3. Hamilton M.B. (2009). *Population Genetics*. Wiley-Blackwell, UK.
4. Hedrick P.W.(2011). *Genetics of Populations*. Jones and Bartlett Publishers, Massachusetts.
5. Jobling, M., Hollox, E., Hurles, M., Kivisild, T. and Tyler-Smith, C. (2013). *Human Evolutionary Genetics*. Garland Science.
6. Knight, J.C. (2009). *Human Genetic Diversity –Functional consequences for Health and Disease*. Oxford University Press, USA.
7. Krebs, J.E, Goldstein, E.S. and Kilpatrick, S.T. (2013) *Lewin's Essential Genes*. Jones and Bartlett learning, USA.
8. Nielsen, R. and Slatkin, M. (2013). An Introduction to Population Genetics: Theory and Applications. Sinauer Associates, Inc.
9. Relethford, J.H. (2012). *Human Population Genetics*. John Wiley & Sons.
10. Snusted, D.P., Simmons, M. J. (2010). *Principles of Genetics*. John Wiley & Sons, New York.

HGS.531 Genetic Epidemiology **Credit Hours: 2**

Unit-I 8 Lectures

Fundamentals of epidemiology: Process of genetic epidemiology; general approaches to access the genetic basis of disease; Basics of population genetics; Mendel's laws (segregation, assortment); aggregation; heritability; basic concepts of epidemiology: frequency, occurrence, prevalence, Incidence; Hardy-Weinberg equilibrium; Association; variation; population bottleneck and founder effects.

Unit-II 18 Lectures

Methods and techniques: Introduction of different types of epidemiological studies: Experimental and observational; Cohort studies; Association studies, Mendelian and non-Mendelian pattern of inheritance;

Suggested readings:

1. Palmer LJ, Burton PR & Smith GD (2011). An introduction to genetic epidemiology (Policy Press, University of Bristol)
2. Dawn TM (2011): Genetic Epidemiology (Springer)
3. Austin M (2013): Genetic Epidemiology: Methods and Applications, 1st Edition (CABI Publishing)

HGS.532: Aging and associated diseases **Credit Hours: 2**

Course Objective: Aging is a complex biological process and a critical risk factor for a variety of human pathologies. This course make students to understand the causal underlying cellular and molecular processes that deteriorates with age.

Unit-I **8 Lectures**

Mechanisms of Aging: Overview and symptoms of aging, DNA damage and repair, cellular senescence and apoptosis, sirtuins and deacetylases, hormones, glycation, protein damage, attenuated immunity, inflammation, accumulation of toxins and garbage in aging, Mechanisms affecting aging due to calorie restriction, insulin signalling, mitochondria and telomerase. Longevity genes and biomarkers of aging, Cancer and aging.

Unit-II **18 Lectures**

Age associated diseases: Atherosclerosis and cardiovascular disease, cancer, arthritis, cataracts, osteoporosis, type 2 diabetes, hypertension and Alzheimer's disease.

Suggested readings:

1. *Edward J. Masoro and Steven N. Austad* (2011). Handbook of the biology of aging. 7th Edition. Academic Press, USA.
2. Jan Vijg (2007). Aging of the Genome: The Dual Role of DNA in Life and Death. 1st Edition. Oxford University Press, UK.
3. Surish Rattan (2003). Modulating Aging and Longevity (Biology of Aging and its Modulation). Springer, USA.
4. Thomas von Zglinicki (2003). Aging at the Molecular Level. Springer Science & Business Media, USA.

A Macieira-Coelho (2003). Biology of aging. I[st] edition. Springer Verlag Berlin Heidelberg, New York

Centre for Human Genetics and Molecular Medicine

School of Health Sciences
Central University of Punjab, Bathinda
Semester III

S.No	Paper Code	Course Title	L	T	P	Cr
		Core courses				
1	HGS.601	Medical Microbiology	2	-	-	2
2	HGS.602	Biosafety, Bioethics and Intellectual Property Rights	2	-	-	2
3	HGS.603	Bioinformatics and Computational Biology	4	-	-	4
4	HGS.600	Dissertation	-	-	8	8
		Elective course 1 (choose any one)				
4	HGS.604	Genetic Diseases and Therapies	4	-	-	4
5	LMM.602	Evolutionary and Developmental Biology	4	-	-	4
		Elective course 2 (choose any one)				
6	HGS.605	Aging, Longevity and Health	4	-	-	4
7	LMM.552	Radiation Biology	4	-	-	4
			16	**0**	**8**	**24**

L: Lectures, T: Tutorial, P: Practical, Cr: Credits

Centre for Human Genetics and Molecular Medicine

School of Health Sciences
Central University of Punjab, Bathinda

HGS.601: Medical Microbiology Credit Hours: 2

Unit: 1 12 Lectures

Prokaryotic, Eukaryotic structure and function: Cell structure and function, Classifications. Bacteria, Fungi, Protozoa, Algae, and viruses, Structure of major viruses, and Viral replication.

Unit: 2 12 Lectures

Growth, nutrition & control: Phases in bacterial growth, Growth Curve, Calculation of G-time, Physical and environmental requirements of growth, Microbial nutritional requirements, Types of culture media. Physical and Chemical methods, Antimicrobial drugs, Antibiotic assays, Drug resistance in bacteria.

Unit: 3 10 Lectures

Microbial Genetics: DNA replication, Transcription and translation, Operon, Horizontal Gene Transfer.

Unit: 4 20 Lectures

Applied Microbiology: Environmental microbiology, Microbial ecology, Aquatic Microbiology, Food, Dairy and Agricultural Microbiology, Industrial Microbiology. Major bacterial diseases of animals and plants, Airborne, Food-borne, Soil-borne, Nosocomial and Sexually Transmitted/Contagious Diseases, Principles of disease and epidemiology, Host-Microbe relationship, Viral pathogenesis, Major viral diseases of plants and animals.Avian Influenza A/H5N1, A/H1N1 Swine Influenza, SARS, AIDS, Japanese encephalitis, Malaria and Tuberculosis, West Nile, Mechanisms of emergence and reemergence.

Suggested Reading:

1. Bauman, R.W. (2011). *Microbiology with Diseases by Body System*. Benjamin Cummings, USA.
2. Capuccino, J.G. and Sherman, N. (2004). *Microbiology-A Laboratory Manual*. Benjamin Cummings, USA.
3. Pelczar, M. J., Chan, E.C.S. and Krieg, N.R. (1993). *Microbiology: Concepts and Applications*. McGraw-Hill Inc. USA.
4. Pommerville, J.C. (2010). *Alcamo's Fundamentals of Microbiology*. Jones & Bartlett Publishers, USA.
5. Prescott, L.M., Harley, J.P. and Klein, D.A. (2004). *Microbiology*. McGraw-Hill Science, USA.
6. Strelkauskas, A., Strelkauskas, J. and Moszyk-Strelkauskas, D. (2009). *Microbiology: A Clinical Approach*. Garland Science, New York, USA.
7. Tortora, G.J., Funke, B.R. and Case, C.L. (2009). *Microbiology: An Introduction*. Benjamin Cummings, USA.

HGS.602: Biosafety, Bioethics and Intellectual Property Rights Credit Hours: 2

Unit: 1 18 Lectures

Biosafety: Good laboratory practices, Biosafety for human Health and Environment. Biosafety issues for using cloned genes in Medicine, Agriculture, Industry, and Ecoprotection. Gene

Pollution, Biological Invasion, Risk and Safety Assessment from Genetically Engineered Organisms, Special Procedures for r-DNA based products, Biological Warfare, Biological Containment (BC) and Physical Containment (PC), CDC Biosafety levels, Biosafety in Clinical Laboratories and Biohazard Management.

Unit: 2 **18 Lectures**

Bioethics: Ethical Theories, Ethical Considerations during Research, Data Manipulations, Subject Consent, Animal Testing. Animal Rights, Perspectives and Methodology, Ethical Issues of the Human Genome Project, Code of Ethics in Medical/clinical laboratories. Healthcare rationing, Ethical Issues of Xenotransplantation, Ethics involved in Embryonic and Adult Stem Cell Research. Ethics in Assisted Reproductive Technologies: animal and human cloning and *In-vitro* fertilization, the element of Informed Consent, Ethical issues in MTP and Euthanasia.

Unit: 3 **18 Lectures**

Intellectual Property Rights (IPRs): Various forms of IP – Patents, Copyright, Industrial Designs, Trade Secrets, Trade Secrets, Geographical Indications and Plant breeder's right; Fair use, plagiarism and open access publishing; Criticism of intellectual property; Indigenous intellectual property.

Unit: 4 **18 Lectures**

Patent system in India: Patent filing in India and abroad: Determination of patentability of inventions, filing a patent application in India: timeline, procedure involved in the granting of a patent, various routes of filing patent application abroad, patent co-operation Treaty (PCT); Patenting of Natural and Genetic resources: Gene patent, Patenting of Living Organisms, Traditional knowledge digital library (TKDL).

Suggested Reading:

1. Clarke, A (2012). *Genetic Counseling: Practice and Principles*. Taylor & Francis
2. Fleming, D.O. and Hunt, D.L. (2006). *Biological Safety: Principles and Practices*. American Society for Microbiology, USA.
3. Mahop, M.T. (2010). *Intellectual Property, Community Rights and Human Rights: The Biological and Genetic Resources of Developing Countries*. Routledge.
4. Rockman, H.B. (2004). *Intellectual Property Law for Engineers and Scientists*. Wiley-IEEE Press, USA.
5. Shannon, T.A. (2009). *An Introduction to Bioethics*. Paulist Press, USA.
6. Thompson J and Schaefer, B.*D (2013). Medical Genetics: An Integrated Approach*. McGraw Hill.
7. Vaughn, L. (2009). *Bioethics: Principles, Issues, and Cases*. Oxford University Press, UK
8. WHO. (2005). *Laboratory Biosafety Manual*. World Health Organization.

HGS.603: Bioinformatics and Computational Biology **Credit Hours: 4**

Unit: 1 **9 Lectures**

Biological databases: Nucleotide Sequence Databases, GenBank, DDBJ, EMBL, Sequence Flatfile and submission process, Protein sequence databases, UniProt in detail, Mapping databases, Genomic databases, Data mining

Unit: 2 **9 Lectures**

Sequence analysis: Gene Prediction methods and programs, Promoter analysis, RNA secondary structure thermodynamics, Refining multiple sequence alignment based on RNA secondary structure predictions, SNP discovery methods and databases, Genotyping, International haplotype map project, 1000 genomes project.

Analysis for protein sequences: Predicting features of individual residues, Predicting function, Neural networks, Protein structure prediction, Protein structure databases, PDB in detail, 3D visualization softwares, Pathway and molecular interaction databases.

Unit: 3 **9 Lectures**

Inferring relationships: Global Vs. local sequence alignments, Dotplots, Scoring matrices, Pairwise sequence alignment, BLAST, Position-Specific scoring and PSI-BLAST, MegaBLAST, BL2SEQ, BLAT, FASTA Vs BLAST, Protein multiple sequence alignments, Multiple structural alignments, Shotgun sequencing, Sequence assembly and finishing.

Unit: 4 **9 Lectures**

Modelling and structure: From protein sequence to structure, theoretical and practical aspects of protein sequence alignments, secondary, tertiary structure prediction, comparative modeling, Docking, protein-protein and protein-ligand docking. Techniques for 3-D structure determination like X-ray, NMR, MS/MS analysis.

Computational drug designing: Structure-based drug design, virtual screening, quantitative structure activity relations, Cheminformatics and pharmacophore mapping in therapeutic development.

Suggested Reading:

1. Baxevanis, A.D. and Ouellette, B.F.F. (2005). *Bioinformatics: A Practical guide to the Analysis of Genes and Proteins*. Wiley-Interscience, USA.

2. Hall, B.G. (2011). *Phylogenetic Trees Made Easy. A How-To Manual*. Sinauer Associates, Inc. USA.

3. Lesk, A.M. (2008). *Introduction to Bioinformatics*. Oxford University Press, UK.

4. Zvelebil, M. and Baum, J. (2007). *Understanding Bioinformatics*, Garland Science, New York, USA.

5. Ramsden, J. (2010). *Bioinformatics: An Introduction* (*Computational Biology*). Springer, India.

6. Ye, S.Q. (2008). *Bioinformatics: A Practical approach*. Chapman & Hall/CRC, UK.

7. Mount, D. (2012). Bioinformatics: Sequence and Genome Analysis. Cold Spring Harbor Laboratory Press.

8. Graur, D., Li, W. H. (2000). Fundamentals of Molecular Evolution. Sinauer Associates.

9. Tisdall, J. (2001). Beginning Perl for Bioinformatics. O'Really Publishers.

10. Orengo, C., Jones, D., Thornton, J. (2005). Bioinformatics: Genes, Proteins and Computers (Advanced Texts). Taylor and Francis Publishers.

HGS 600: Dissertation **Credit Hours: 8**

Elective course 1

HGS. 604: Genetic Diseases and Therapies **Credit Hours: 4**

Centre for Human Genetics and Molecular Medicine

School of Health Sciences

Central University of Punjab, Bathinda

Course Objectives: The students will become familiar with the various types of genetic disorders and the therapies which although are in the research stage but may emerge as a future treatment method.

Unit: 1 — **9 Lectures**

Monogenic Disorders: Albinism, Cystic fibrosis, Achondroplasia, Huntington disease, Muscular dystrophy, X-linked rickets

Multifactorial Diseases in man: Diabetes, Celiac disease, Liver cirrhosis, Obesity, Hypertension, Cancer as genetic disease, Cancer-prone syndromes.

Unit: 2 — **18 Lectures**

Genomic Imprinting and Human Diseases: Uniparental Disomy & Genomic Imprinting Prader-Willi & Angelman syndromes, Beckwith-Wiedeman syndrome & Silver Russell Syndrome; Imprinting and brain and behaviour; Imprinting and Cancer.

Neurofibromatosis I; X/Y linked Human Syndromes due to Numerical Chromosomal Anomalies

Unit: 3 — **18 Lectures**

Genetic Screening: Risk calculations, Population screening for genetic disease-adult, Clinical utilization of presymptomatic and predispositional testing, Presymptomatic testing for genetic diseases and malignancy, carrier detection; prenatal and postnatal screening; Assisted reproductive techniques and Pre-implantation diagnosis and Genetic Counseling

Unit: 4 — **9 Lectures**

Therapies for genetic disorders and Multifactorial diseases: Stem Cell Therapies: Stem cell types, cord blood cells, bone marrow transplantation, current stem cell therapies, Gene Therapies, Problems in gene therapy, Chemo and Radio therapies; Techniques in tissue engineering: tissue grafting, synthetic blood, skin grafts and metallic implants.

Suggested reading:

1. Brown, S.M., (2009). *Essentials of Medical Genomics*. Wiley-Blackwell.
2. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009), *Lewin's Gene X*. Jones & Barlett.
3. Krebs, J.E., Goldstein, E.S. and Kilpatrick, S.T. (2014). *Lewin's Genes XI*. Jones and Bartlet India Pvt. Ltd.
4. Lodish, H., Berk, A., Chris, A. K., Krieger, M. (2008), *Molecular Cell Biology*. W.H. Freeman, USA.
5. Milunsky A, Milunsky J (2009). *Genetic Disorders and the Fetus: Diagnosis, Prevention and Treatment*, 6th Edition. Wiley-Blackwell publishers.

LMM.602 Evolutionary and Developmental Biology — **Credit hours: 4**

Course Objective: This course is an introduction to animal evolution and development. The principal objective is to introduce students to the origin of life and developmental processes that lead to the establishment of the body plan of vertebrates and the corresponding cellular and genetic mechanisms. This will allow students, at a later stage, to understand organogenesis and histogenesis, as well as pathology related to mechanisms of development and differentiation.

Unit: 1 — **16 Lectures**

Emergence of evolutionary thoughts & Origin of life: Lamarckism, Darwinism, Concepts of variation, adaptation, struggle, Mendelism, Spontaneity of mutations, Theories of phyletic

gradualism vs. punctuated equilibria, Modern evolutionary synthesis. Origin of basic biological molecules, Abiotic synthesis of organic monomers and polymers, Concept of Oparin and Haldane, Experiment of Miller (1953), The first cell, Evolution of prokaryotes, Origin of eukaryotic cells, Evolution of unicellular eukaryotes, Anaerobic metabolism, Photosynthesis and aerobic metabolism.

Unit: 2 **14 Lectures**

Paleontology and molecular evolution: The evolutionary time scale, Eras, periods and epoch, Major events in the evolutionary time scale, Origins of unicellular and multicellular organisms, Stages in primate evolution including *Homo sapiens*. Concepts of neutral evolution, Molecular divergence and molecular clocks, Molecular tools in phylogeny, Classification and identification; Origin of new genes and proteins; Gene duplication and divergence.

Unit: 3 **14 Lectures**

Basic concepts of development: Totipotency, Commitment, Specification, Induction, Competence, Determination and Differentiation, Morphogenetic gradients, Cell fate and cell lineages, Stem cells, Genomic equivalence and the cytoplasmic determinants, Imprinting, Mutants and transgenics in analysis of development.

Unit: 4 **10 Lectures**

Gametogenesis, fertilization and cell death: Production of gametes, Cell surface molecules in sperm-egg recognition in animals; Embryo-sac development and double fertilization in plants, Zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals, Embryogenesis and establishment of symmetry in plants, Seed formation.Hypersensitive response, functions, relevance with diseases, apoptosis, Caspases, Importance of PCD in plant development, role of PCD, model of PCD.

Suggested Reading:

1. Darwin, C.R. (1911). *On the origin of species by means of natural Selection, or preservation of favoured races in the struggle for life*. Hurst Publishers, UK.
2. Dawkins, R. (1996). *The Blind Watchmaker*, W.W. Norton & Company Jones and Bartlett Publishers.
3. Futuyma, D.J. (2009). *Evolution*. Sinauer Associates Inc. USA.
4. Hake, S. and Wilt, F. (2003). *Principles of Developmental Biology*. W.W. Norton & Company, New York, USA.
5. Hall, B.K. and Hallgrimsson, B. (2007). *Strickberger's Evolution*. Jones and Bartlett Publishers, India.
6. Lewin, R. (2004). *Human Evolution - An Illustrated Introduction*. Wiley-Blackwell, USA.
7. Scott, F. and Gilbert, S.F. (2010). *Developmental Biology*. Sinauer Associates, Inc. USA.
8. Slack, J.M.W. (2005). *Essential Developmental Biology*, Wiley-Blackwell, USA.

Elective course 2 (choose any one)

HGS.605 Aging, Longevity and Health Credit Hours:4

Centre for Human Genetics and Molecular Medicine

School of Health Sciences

Central University of Punjab, Bathinda

Course Objectives: Aging is a conserved biological process and it is also the critical risk factor for a variety of human pathologies. This course helps students to understand the causal underlying cellular and molecular processes that deteriorate with age and lead to increased disease susceptibility.

Unit 1 — **9 Lectures**

Basic Concept &Theories of Aging: Overview and symptoms of aging, model organisms, Theories of aging- Genetic (Genetic control, Hayflick limit, DNA damage, error and repair, accumulated mutation, gene mutation, telomerase, antagonistic pleiotropy and redundant DNA theories), Non-genetic (Wear and tear, waste accumulation, cross-linkage, free-radical, order to disorder and disposable soma) and Physiological theories (Immunological, neuroendocrine, death hormone (DECO), thymic-stimulating, rate of living and calorie restriction theories).

Unit: 2 — **18 Lectures**

Factors influencing Aging: DNA damage and repair, cellular senescence and apoptosis, sirtuins and deacetylases, hormones, glycation, protein damage, attenuated immunity, inflammation, accumulation of toxins and garbage in aging,

Unit: 3 — **18 Lectures**

Molecular Mechanism of Aging: Mechanisms affecting aging due to calorie restriction, insulin signalling, mitochondria and telomerase. Longevity genes and biomarkers of aging, Cancer and aging.

Unit: 4 — ***9 Lecures***

Age associated diseases and Healthy Aging: Atherosclerosis and cardiovascular disease, cancer, arthritis, cataracts, osteoporosis, type 2 diabetes, hypertension and Alzheimer's disease. Concept of healthy aging.

Suggested readings:

1. *Edward J. Masoro and Steven N. Austad* (2011). Handbook of the biology of aging. 7th Edition. Academic Press, USA.
2. Jan Vijg (2007). Aging of the Genome: The Dual Role of DNA in Life and Death. 1st Edition. Oxford University Press, UK.
3. Surish Rattan (2003). Modulating Aging and Longevity (Biology of Aging and its Modulation). Springer, USA.
4. Thomas von Zglinicki (2003). Aging at the Molecular Level. Springer Science & Business Media, USA.
5. A Macieira-Coelho (2003). Biology of aging. I[st] edition. Springer Verlag Berlin Heidelberg, New York.

LMM.552: Radiation Biology — **Credit Hours:4**

Course Objectives: From this course the students would have fair knowledge of basic concepts of radiation biology such as radiation physics, radiation biology and radiological protection. the students will also learn the applications of radiations and radio diagnosis/therapeutics.

Unit: 1 — **20 Lectures**

Centre for Human Genetics and Molecular Medicine

School of Health Sciences

Central University of Punjab, Bathinda

Basics of Radiation Biology: Types of radiation, characteristics and biological effects of ionizing radiations, types of radiation emitters and their interaction with matter, linear energy transfer and relative biologic effectiveness.

Radioisotopes and stable isotopes. Radiation protection, maximum permissible dose (MPD). Radiation dosimetry, personnel monitoring, use of various radiation survey meters, film badges and room contamination monitors. Radiation hazard evaluation and control: control of external and internal exposure. Natural and man-made radiation exposures, major radiation accidents and environmental radiation exposure.

Radiation Safety and Regulation: Storage and handling of radioactive sources, safe work practice and decontamination. Radiation protection measures in industrial establishment, radioisotope labs, diagnostic/therapeutic installation and during transportation of radioactive substances, disposal of radioactive waste, administrative & legislative aspect of radiation protection

Unit: 2 **18 Lectures**

The oxygen Effect: Chemistry and biology of reactive oxygen species (ROS), oxidative stress and free radicals their role in cell metabolism, effects on marco/micromocules (proteins, lipids and DNA) and diseases (diabetes, neurodegenerative diseases, inflammation and cardiovascular disorders). Antioxidant defence system.

Radiation and Cell Signalling: Extracellular mediators and enzymes involved in radiation-induced bystander effects (RIBE) and their role in signalling, intracellular pathways and apoptotic and cell cycle regulatory factors (p53, p21, p34, and MDM2). Correlation between membrane integrated channels and mitochondrial functions with radiation-induced bystander effects. Radiation immunology: immunity response, radiation as immunosuppressive agent

Unit: 3 **18 Lectures**

Acute Radiation Effects: Concept of LD_{50}, central nervous system syndrome, gastro-intestinal syndrome, bone marrow syndrome and skin reactions. **Chronic effects of radiations:** Early and delayed effects of radiation exposure, cataractogenesis and carcinogenesis. Hereditary effects of radiation: chromosomal and chromatid aberrations, mutations in growth promoting proteins, mutations causing loss of growth-inhibition and cell cycle control.

Unit: 4 **16 Lectures**

Diagnostic radiology: Sources of radiation, doses and their risk in diagnostic radiology. Interventional radiology and nuclear medicine. Molecular techniques in radiobiology and gene therapy. Radiations in tumour therapy: theoretical basis for radiation and chemotherapy interactions. Experimental chemotherapy and drug resistance. Radio-sensitizers, radio-protectors and bio-reductive drugs.

Suggested Reading

1. Bushong, S. C. (2008). *Radiologic Science for Technologists: Physics, Biology, and Protection,* Mosby Publishers, Inc, USA.
2. Forshier, S. (2008) *Essentials of Radiation, Biology and Protection,* Cengage Learning, USA Cengage.

3. Hall, E. J. and Giaccia, A. (2011). *Radiobiology for the Radiologist*, Lippincott Williams & Wilkins, USA.
4. Halliwell, B. and Gutteridge, J. M. C. (2007) *Free Radicals in Biology and Medicine*, Oxford University Press, USA.
5. Knoll, *G. F. (2010) Radiation Detection and Measurement*, Wiley, John & Sons, USA.
6. Martin, A., Harbison, S., Beach, K. and Cole, C. (2012) *An Introduction to Radiation Protection*, Hodder Arnold Publishers, UK.
7. Sitaramaya, A. (2010). Signal Transduction: Pathways, Mechanisms and Diseases. Springer

Centre for Human Genetics and Molecular Medicine

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Semester IV

S.No	Paper Code	Course Title	L	T	P	Cr
1	HGS.621	Structural Biology and Pharmacogenomis	4	-	-	4
2	HGS.622	Advances in Nutrigenomics	4	-	-	4
3	HGS.600	Dissertation				16
			6	0	4	24

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HGS. 621: Structural Biology and Pharmacogenomics Credit hours :4

Unit: 1 18 Lectures

Structure of Biomolecules: Introduction to different types of biochemical bonds and interactions, Different structural confirmations of DNA, RNA and Proteins, Primary and secondary structure of nucleic acids, secondary, tertiary and quaternary structure of Proteins.

Unit: 2 18 Lectures

Structure analysis of biomolecules: Prediction analysis method and tools for three dimensional structures, thermodynamics and kinetics of conformational transition, protein folding, tools and techniques for studying macromolecular interaction.

Unit: 3 18 Lectures

Experimental analysis of biomolecules: Experimental methods for purification of DNA, RNA and Proteins, Ultra centrifugation, sedimentation velocity and equilibrium-determination of molecular weights, Methods used for determination of protein structure, introduction to structural databases for protein studies.

Unit: 4 18 Lectures

Pharmacogenomics: Introduction with example of Methotrexate, Warfarin, _____, Trends in pharmacogenomics studies, Functional genomics in new drug discovery, Genome-guided identification and validation of drug targets, personalized medicine.

Suggested readings:

1. Brandon, C. and Tooze, J. (1999) Introduction to Protein Structure. Garland Publishers, London.

2. Hartl, D.L. and Jones, E.W. (2005). Genetics: Analysis of Genes and Genomes. Jones and Barlett Publishers, Massachusetts. 3. Jain, K.K. (2001). Drug Discovery: Current Trends and Future Prospects. Urch Publishers, London.

4. Leach, A.R. (2001). Molecular Modelling. Principles and Applications. Addison Wesley Longman, Essex.

5. Nelson, D.L. and Cox, M.M. (2008). Lehninger's Principles of Biochemistry. W.H. Freeman and Co., New York.

HGS. 622: Advances in Nutrigenomics **Credit hours : 4**

Unit: 1 18 Lectures

Nutritional Biochemistry: Essential and non-essential nutrients, measurement of calorie values of foods, recommended dietary allowances, basal metabolic rate (BMR), malnutrition, malabsorption and interventional strategies.

Unit: 2 18 lectures

Nutrigenomics vs Nutrigenetics: Diet and gene expression: nutrients as regulators of activity and transcription factors. Diet in early life and metabolic programming. Diet as a possible risk or preventive factor in illnesses. Gene polymorphisms and responses to diet. Examples related to cardiovascular disease, cancer, osteoporosis.

Unit: 3 18 Lectures

Biomarkers and recent advances in Nutrigenomics: Risk/benefit biomarkers, Genetic and nutritional control of Lipid Metabolism, Metabolomics and personalized nutrition.

Unit: 4 **18 Lectures**

Metabolism and Epigenetics: Metabolic Regulation of DNA Methylation in Mammals, Dietary and Metabolic compounds affecting chromatin dynamics/remodeling, Effect of Diet on Epigenetic processes.

Suggested readings:

1. Ferguson, L,R.(2013) *Nutrigenomics and Nutrigenetics in Functional Foods and Personalized Nutrition*. CRC Press.
2. Tollefsbol T (2011). *The New Molecular and Medical Genetics*. Elsevier Inc
3. Simopoulos A.P. and Ordovas J.M. (2004). Nutrigenetics and Nutrigenomics Karger Publishers
4. Rimbach, G and Fuchs, J (2005) *Nutrigenomics (Oxidative Stress and Disease)*. CRC press

HGS 600: Dissertation **Credit Hours: 16**

Centre for Human Genetics and Molecular Medicine

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Credit Structure of M.Sc. Life Sciences with specialization in Human Genetics

Course type	Required as per CBCS system, UGC	Actual Credit distribution
Foundation	10 - 15% i.e.7.2 to 10.8	10
Elective	25 - 35% i.e.18 to 25.2	19
Core	50 - 65% i.e. 36 to 46.7	39
Total credits (excluding dissertation)		**68**

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M.Sc. (Life Sciences with Specialization in Human Genetics)

SEMISTER - I

S.No	Paper Code	Course Title	L	T	P	Cr
		Foundation courses				
1	LSL.501	Research Methodology	2	-	-	2
2	LSL.502	Introduction to Biostatistics	2	-	-	2
3	LSP.503	Introduction to Biostatistics	-	-	1	1
4	LSL.504	Introduction to Cell and Molecular Biology	4	-	-	4
5	LSP.505	Introduction to Cell and Molecular Biology	-	-	1	1
		Core courses				
6	LSL.506	Basic and Clinical Biochemistry	3	-	-	3
7	LSP.507	Basic and Clinical Biochemistry	-	-	1	1
8	LSL.508	Concepts of Genetics	3	-	-	3
9	LSP.509	Concepts of Genetics	-	-	1	1
10	HGL.510	Human Cytogenetics and Human Biochemical Genetics	3	-	-	3
11	HGP.511	Human Cytogenetics and Human Biochemical Genetics	-	-	1	1
12	XXX	**Interdisciplinary Elective Course-1 (choose from other centre)**	2	-	-	2
		Total	19	0	5	24
Interdisciplinary courses offered to students of other centre						
13	HGL.512	Basics of Human Genetics	2	-	-	2
14	HGL.513	Basics of Microscopy	2	-	-	2
15	HGL.514	Concepts of Immunogenetics	2	-	-	2
16	HGL.515	Gene, Genome and Genomics	2	-	-	2

L: Lectures, T: Tutorial, P: Practical, Cr: Credit.

2

Centre for Human Genetics and Molecular Medicine

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LSL.501: Research Methodology Credit Hours: 2

Course Objectives: To ensure that the students of Human Genetics understands various aspects of research related methods, technical/scientific writings and literature search.

Unit 1 5 Lectures

General principles of research: Meaning and importance of research, critical thinking, formulating hypothesis and development of research plan, review of literature, interpretation of results and discussion.

Unit 2 10 Lectures

Technical writing: Scientific writing that includes the way of writing Synopsis, research paper, poster preparation and presentation, and dissertation.

Unit 3 5 Lectures

Library: Classification systems, e-Library, web-based literature search engines

Unit 4 16 Lectures

Entrepreneurship and business development: Importance of entrepreneurship and its relevance in career growth, characteristics of entrepreneurs, developing entrepreneurial competencies, types of enterprises and ownership (large, medium SSI, tiny and cottage industries, limited, public limited, private limited, partnership, sole proprietorship) employment, self-employment and entrepreneurship, financial management-importance and techniques, financial statements- importance and its interpretation, and Intellectual Property Rights (IPRs).

Suggested Readings:

1. Gupta, S. (2005). *Research methodology and Statistical Techniques*. Deep & Deep Publications Pvt. Ltd. New Delhi.
2. Kothari, C.R. (2008). *Research Methodology*. New Age International Pvt. Ltd. New Delhi.
3. Standard /Reputed Journal authors' instructions. Examples: Nature Genetics, American Journal of Human Genetics, European Journal of Human Genetics, Human Mutation.

LSL.502: Introduction to Biostatistics. **Credits Hours: 2**

Course Objectives: This course will give a basic but significant exposure towards better understanding of biostatistics and application. Applications of biostatistical approaches are pivotal in testing hypothesis, designing experiments, analyzing experimental data and interpreting the results of biological research.

Unit 1 6 Lectures

Overview of Biostatistics: Difference between parametric and non-parametric statistics, Univariant and multivariant analysis, Frequency distribution, Measures of central tendency and variation, Graphical representation of data, Levels of significance, Hypothesis testing.

Unit 2 8 Lectures

Descriptive statistics: Probability and probability distributions (Binomial, Poisson and Normal), Kurtosis and Skewness, Correlation and regression.

Unit 3 **8 Lectures**

Experimental design and analysis: Sampling techniques, Sampling theory, Various steps in sampling, Sampling distribution.

Unit 4 **14 Lectures**

Inferential Statistics: Chi-Square test, Student's t-test, F-Test, Z-Test, Mann-Whitney U-test, Wilcoxon signed-rank, One-way and two-way analysis of variance (ANOVA),

Suggested Readings:

1. Norman, G. and Streiner, D. (2008). *Biostatistics: The Bare Essentials* (with SPSS), 3rd Edition, Decker Inc. USA.
2. Sneath, P.H.A. and Sokal, R.R. (1973). *Numerical Taxonomy*. Freeman, San Francisco.
3. Sokal, R.R. and Rohlf, F.J. (1994). *Biometry: The Principles and Practices of Statistics in Biological Research*. W.H. Freeman publishers, USA.
4. Banerjee P.K (2014). *Introduction to Biostatistics*. S.Chand, India
5. Daniel WW (2010). *Biostatistics: A Foundation for Analysis in the Health Sciences*. John Wiley and Sons Inc.
6. Bailet NTJ. *Statistical Methods in Biology*. Cambridge Univ. Press.
7. Glaser AN. *High-Yield Biostatistics*. Lippincott Williams & Wilkins.

LSP.503: Introduction to Biostatistics – Practical **Credit Hours: 1**

1. Experimental design and analysis.
2. Training on basic usage of Microsoft Word, Microsoft Excel, Microsoft PowerPoint and Internet Explorer.
3. Optimizing web search: Google advanced search, Boolean operators, Literature search using Google Scholar, HighWire.
4. Bibliography management and research paper formatting using reference software EndNote.
5. Performing statistics analyses using MS Excel Analysis toolpack.
6. Creating a functional website using HTML.
7. Basic programming using DOS batch files and Auto Hot Key.

*Practical will be conducted depending upon the faculty/facility.

LSL.504: Introduction to Cell and Molecular Biology **Credit Hours: 3**

Learning Objective: Students will understand the structures and purposes of basic components of membranes, and organelles and their related functions. Understanding the molecular processes of DNA replication, transcription, and translation, and how they are managed in cells. Understand the basic mechanisms of cellular signal transduction and regulation of gene expression.

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Unit: 1 15 Lectures

Introduction to the Cell: prokaryotic and eukaryotic cells, Single cell to multicellular organisms.

Membrane Structure and Function: Models of membrane structure, membranes of intracellular organelles, Membrane transport.

Protein Secretion and Sorting: Structure and functions of intracellular organelles, Intracellular traffic and secretory pathways, protein sorting, endocytosis and, exocytosis.

Unit: 2 12 Lectures

The Cytoskeleton: cell cytoskeleton and its organization including extracellular matrix, adhesions and junctions.

Cell-cell communication and cell growth: Overview of cell signaling, cell surface receptors and second messengers, cell cycle and its regulation.

Unit: 3 15 Lectures

Chemical structure and functions of Nucleic acids: Chemical structure of DNA and RNA Watson-Crick model, Different forms of DNA and RNA, Organelle DNA, Refgulation of nucleosome asssembly Chromatin.

Gene and Genome organization: Split genes, Overlapping genes, Transposons & retrotransposons, Gene clusters, Mechanism of DNA replication, DNA damage and their repair.

Unit: 4 12 Lectures

Transcription and mRNA Processing: transcription and transcription factors, Transcriptional and posttranscriptional gene silencing, mRNA processing: Capping, Polyadenylation, Splicing, editing, mRNA stability,.

Translation: Genetic code, the translation machinery, mechanisms of chain initiation, elongation and termination, regulation of translation, post- translational modifications of proteins.

Suggested Reading:

1. Alberts, B., Bray, D., Lews, J., Raff, M., Roberts, K. and Watson, J.D. (2010). *Molecular Biology of the cell*. Garland publishers, Oxford.
2. Celis, J.E. (2006). *Cell biology: A laboratory handbook*, Vol 1, 2, 3. Academic Press, UK.
3. Gupta, P.K. (2008). *Cytology, Genetics and Evolution*. Rastogi publications, Meerut, India
4. Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. John Wiley & Sons. Inc. New Delhi, India.
5. Robertis, (2011). *Cell and Molecular Biology*. Lippincott Williams & Wilkins
6. Fasman, G.D. (1989). *Practical Handbook of Biochemistry and Molecular Biology*. CRC Press, Taylor and Francis Group, UK.
7. James, D.W., Baker, T.A., Bell, S.P., Gann, A. (2009). *Molecular Biology of the Gene*. Benjamin Cummings, USA.
8. Jocelyn, E.K., Elliott, S.G., Stephen, T.K. (2009). *Lewin's Genes X*. Jones & Bartlett Publishers, USA.

9. Johnson, A., Lewis, J., Raff, M. (2007). *Molecular Biology of the Cell*. Garland Science, USA.
10. Lodish, H., Berk, A., Chris, A.K. and Krieger, M. (2011). *Molecular Cell Biology*. W.H Freeman, USA.
11. Sambrook, J., Fritish, E.F., Maniatis, T. (2012). *Molecular cloning: A laboratory manual*. Cold Spring Harbor Laboratory Press, New York.

LSP.505: Introduction to Cell and Molecular Biology **Credit Hours: 1**

1. Preparation of mitotic and meiotic chromosomes.
2. Study of structure of cell organelles through electron micrographs.
3. Instrumental methods for cell biology-centrifugation, chromatography.
4. Bacterial staining and identification.
5. Histochemical techniques (Fixing, Processing, Staining).
6. Basic Cell culture
7. Isolation, quantification and quality assessment of DNA and RNA
8. PCR and RFLP
9. Electrophoresis (Agarose and SDS-PAGE)

*Practical will be conducted depending upon the faculty/facility.

LSL.506: Basic and Clinical Biochemistry **Credits Hours: 3**

Course Objectives: The course aims to provide an advanced understanding of the core principles and topics of Biochemistry and their experimental basis.

Unit 1 **15 Lectures**

Essentials of clinical biochemistry: Molecular structure and physical properties of water, Ionization of water, weak acids and weak bases, pH and buffers. Interpretation of biochemical tests, Clinical hematology, chemical composition of blood, urine and cerebrospinal fluids, water and sodium balance, Acid-base balance disorders, Potassium, calcium, magnesium and phosphate metabolism and associated diseases. Vitamins and trace elements disorders and metal poisoning.

Unit 2 **14 Lectures**

Biomolecules and metabolic disorders: Structure and functions of carbohydrates, lipids, amino acids, proteins, nucleic acids and vitamins. Bioenergetics and thermodynamics, Phosphoryl group transfer and ATP, Biological oxidation-reduction reactions, Glycolysis, citric acid cycle and oxidative phosphorylation. Liver function test, jaundice, diabetes mellitus, hypoglycemia, hypertension, hypo and hyperthyroidism.

Unit 3 **10 Lectures**

Conformation of Biomolecules: Ramachandran plot, Secondary, Tertiary and Quaternary structure, Domains, Motif and Folds. Protein denaturation and folding, Oxygen binding proteins, Hill equation, Bohr Effect, Nucleic acids: A-, B-, Z-DNA forms, tRNA, micro-RNA, Stability of protein and Nucleic acid structures.

Unit 4 **15 Lectures**

Enzymology: Classification, Principles of catalysis, Mechanism of enzyme catalysis, Enzyme kinetics, Enzyme inhibition, Enzyme regulation, Isozymes and Clinical enzymology.

Suggested Reading:

1. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2010). *Biochemistry*. W.H. Freeman & Company. USA.
2. Brown, T.A. (2006). *Gene Cloning and DNA analysis: In Introduction*. Blackwell Publishing Professional. USA.
3. Haynie, D.T. (2007). *Biological thermodynamics*. Cambridge University. UK.
4. Mathews, C.K., Van Holde, K.E. and Ahern, K.G. (2000). *Biochemistry*.Oxford University Press Inc. New York.
5. Nelson, D. and Cox, M.M. (2008). *Lehninger Principles of Biochemistry*. BI publications Pvt. Ltd. Chennai, India.
6. Ochiai, E. (2008). *Bioinorganic Chemistry: A survey*. Academic Press. Elsevier, India.
7. Randall, D. J., Burggren, W: and French, K. (2001). *Eckert animal physiology*. W.H. Freeman & Company. USA.
8. Raven, P.H., Johnson, G.B. and Mason, K.A. (2007). *Biology*. Mcgraw-Hill. USA.
9. Shukla AN (2009). *Elements of Enzymology*. Discovery Publishing. New Delhi, India.
10. Voet, D. and Voet, J.G. (2008). *Principles of Biochemistry*. CBS Publishers &Distributors. New Delhi, India.
11. R Swaminathann. (2011). Handbook of clinical biochemistry. 2 edition, World Scientific Publishing Company, New Jersey, USA
12. Martin A Crook et al. (2012). Clinical Biochemistry and metabolic medicine. CRC press, Taylor & Francis Group, USA

LSP.507: Basic and Clinical Biochemistry – Practical **Credit Hours: 1**

1. Preparation of solutions, buffers, pH setting etc.
2. Amino acid and carbohydrate separations by paper and thin layer chromatography.
3. Quantitative Estimation of proteins, sugars, total lipids and amino acids.
4. Assay and estimation of different enzymes e.g. invertase, amylases, acid and alkaline phosphatases in plant seeds.
5. Principle and application of electrophoresis, Native, SDS PAGE.
6. Estimation of total phenolic compounds.
7. Extraction and estimation of vitamins.

*Practical will be conducted depending upon the faculty/facility.

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LSL.508: Concepts of Genetics. Credits Hours: 3

Course Objectives:

Course on concept of genetics would be necessary to estimate and understand origin, existence and propagation of living organisms as a whole. Basic knowledge of genetics is also necessary in application of various inheritance prediction based models for human welfare.

Unit 1 **10 Lectures**

Basics of Inheritance: Mendel's Laws of inheritance, Concept of segregation, independent assortment and dominance, Chromosome theory of inheritance, Alleles and multiple alleles, Locus concept, Epistasis, Crossing over and recombination, Pedigree analysis, Linkage analysis and gene mapping: Coupling and repulsion phase linkage, Application of Mendel's laws to populations, Hardy-Weinberg principle, inheritance of quantitative traits.

Unit 2 **17 Lectures**

Chromosomal mutations and Gene concept: Type of chromosomal aberrations: deletions, duplications, inversions, translocations, Change in chromosome number: trisomy and polyploidy. Evolutionary history of bread wheat, Aneuploids–nullisomics, monosomics, and trisomics, Somatic aneuploids, Changes in chromosome structure, Properties of chromosomes for detection of structural changes.Mutations: Spontaneous and induced mutations, Somatic vs germinal mutation.Gene concept: Fine structure of gene and gene concept, Fine structure analysis — Benzer's experiments, Complementation analysis and fine structure of gene, Complementation and recombination.

Unit 3 **17 Lectures**

Sex determination: Sex determination and Sex linked inheritance, Sex determination in humans, *Drosophila* and other animals, Sex determination in plants, Sexlinked genes and dosage compensation in human, *Drosophila* and *C.elegans*.

Unit 4 **14 Lectures**

Extra-chromosomal inheritance: Chloroplast and Mitochondrial inheritance, Yeast, *Chlamydomonas/Neurospora* and higher plants, Symbiosis.

Suggested Readings:

1. Klug WS and Cummings MR. Concepts of Genetics. Prentice-Hall.
2. Anthony, J.F., Miller, J.A. ,Suzuki, D.T., Richard, R.C., Gilbert, W.M. (1998). *An introduction to Genetic Analysis*. W.H. Freeman publication, USA.
3. Pierce BA. Genetics: A Conceptual approach. Freeman Publishers.
4. Hartle DL and Jones EW. Genetics: Analysis of Genes and Genomes. Jones & Bartett.
5. Atherly, A.G., Girton, J R., Mcdonald, J.F. (1999). *The science of Genetics*. Saundern College publication.

6. Snusted, D.P., Simmons, M. J. (2010). *Principles of Genetics*. John Wiley & Sons, New York.

8. Griffith AF et al. An Introduction to Genetic Analysis. John Wiley & Sons.

LSP.509: Concepts of Genetics – Practical **Credit Hours: 1**

1. Monohybrid and dihybrid ratios, Multiple alleles, Epistasis – Problems.
2. Inheritance patterns in Human – Numericals on Pedigree analysis- Autosomal patterns, X–linked patterns, Y–linked patterns.
3. Segregation analysis in Drosophila (Monohybrid, Dihybrid)
4. Analysis on Linkage
5. Identification of inactivated X chromosome as Barr body and drumstick
6. Studies of a Model organism: *E.coli*, *C.elegans*, *D. melanogaster* and *D. rerio*.

* Practical will be conducted depending upon faculty/ facilities.

HGL.510: Human Cytogenetics and Human Biochemical Genetics **Credits Hours: 4**

Course Objectives: The basic and specialized knowledge and understanding the aspects of Cytogenetics and Biochemical genetics is essential to understand Human Genetics.

Unit 1 **18 Lectures**

General features of Human Chromosome and Chromosome staining: Chromatin structure, Constitutive and Facultative Heterochromatin, Centromeres, Telomere and its maintenance, Nuclear Organization Region (NOR), Sister Chromatid Exchanges (SCE), Mosaicism, Structure of Human X and Y chromosome, Human Artificial Chromosome.

Unit 2 **18 Lectures**

Cytogenetic and Molecular Cytogenetic Techniques: Chromosome Banding Techniques, Fluorescent in situ hybridization (FISH), Comparative Genomic Hybridization (CGH) mapping technique, Whole Chromosome Painting.

Unit 3 **18 Lectures**

The concept of Biochemical Polymorphism: Concept of enzyme and protein polymorphism; Effects of multiple gene loci on protein structure; Molecular structure, biosynthesis and genetics of the ABH antigens, Rh antigens and MN antigens.

Norsmal Biochemical Polymorphisms and Variants: Quantitative and qualitative variation of enzymes; Haemoglobin variants; Effects of Single Amino Acid Substitutions i.e. Sickle cell disease, Genetics of steroid and insulin receptors.

Unit 4 **18 Lectures**

Disorders due to Abnormal Variants of lysosomal enzymes, lipids and DNA nitrogenous bases: Disorders due to abnormal Lysosomal enzymes–Tay- Sachs disease and Mucopolysaccharidoses, Disorders of Lipoprotein and lipid metabolism – Hyper Lipoproteinemia: Disorders of Purine metabolism- Lesch Nyhan syndrome; Disorders of Pyrmidine metabolism – Orotic Aciduria

Suggested readings:

1. Gillham, N. (2011). *Genes, Chromosomes and Disease*. Pearson
2. Griffiths, A.J.F., Wessler, S.R. and Carroll, S.B. (2012). *An Introduction to Genetic Analysis*. W.H. Freeman Publication, USA.
3. Hein, S. and Mitelman, F. (2009). *Cancer Cytogenetics*. Wiley-Blackwell.
4. Klug, W.S., Cummings, M.R., Spencer, C.A. and Palladino, M.A. (2012). *Concepts of Genetics*. Pearson.
5. Korf, B.R and Irons, M.B. (2013). *Human Genetics and Genomics*. Wiley-Blackwell.
6. Kumar, A. and Srivastava, M. (2012) A textbook of Molecular Cytogentics, Narendra Publishing House, India
7. Purandare, H. and Chakravarty, A. (2000)*Human Cytogenetic Techniques and Clinical Applications*. Bhalani Publishing House, Mumbai, India.
8. Ram, M. (2010). *Fundamental of Cytogenetics and Genetics*. PHI Learning Pvt. Ltd.
9. Roy, D. (2009). *Cytogenetics*. Narosa Publishing House. New Delhi, India.
10. Tom, S and Read, A (2010). *Human Molecular Genetics*. Garland Science.
11. Shukla, A.N. (2009). *Elements of enzymology*. Discovery Publishing. New Delhi, India.
12. Voet, D. and Voet, J.G. (2008). *Principles of Biochemistry*. CBS Publishers & Distributors, New Delhi.
13. . Murray, R.K., Bender, D.,Botham, K., M.,Kennelly, P. J., Rodwell, V. W. and Weil, P.A. (2012). *Harpers Illustrated Biochemistry*. McGraw-Hill Medical.
14. Nelson, D. and Cox, M.M. (2013). *Lehninger Principles of Biochemistry*. W.H. Freeman.

HGP.511: Human Cytogenetics and Human Biochemical Genetics **Credit Hours: 1**

1. Cell counting by using hemocytometer.
2. Calculation of cell doubling time.
3. Human lymphocyte culture.
4. Karyotyping of normal and abnormal chromosome sets.
5. Identification of inactivated X chromosome as Barr body and drumstick.
6. Chromosome banding.
7. FISH
8. Sickling Test
9. Separation of abnormal heamoglobins
10. Estimation of Hb A2
11. Red Cell Enzymes – ACP, ESD
12. Plasma proteins – HP, CP

*Practical will be conducted depending upon the faculty/facility.

Interdisciplinary courses offered to students of other centre

HGL.512: Basics of Human Genetics **Credits Hours: 2**

Course Objective: The course gives a overview of basics of Human Genetics and makes familiar with the common genetic disorders.

Unit 1 **18 Lectures**

Chromosomal analysis and Genetic assessment: Classification of Genetic Disorders, Human Chromosomes, The Life Cycle of a Somatic Cell, Mitosis, Meiosis, Medical Applications of Chromosomes, Drawing of a pedigree, Consanguinity.

Unit 2 **18 Lectures**

Common chromosomal disorders and Mendelian disorders: Down syndrome, Edwards syndrome, Patau's syndrome and other trisomies, Structural aberrations, Single gene disorders: autosomal and sex chromosomal, Multifactorial disorders.

Suggested Reading:

1. Emery and Rimoin's, et al., 2007. Principles and Practice of Medical Genetics. Fifth Edition. Volume - II, Churchill Livingstone Elsevier.
2. Emery and Rimoin's, Principles and Practice of Medical Genetics e-dition: 3 Volume Set, Churchill Livingstone Elsevier
3. De Grouchy & Turleau.1984. Clinical atlas on Human Chromosomes.
4. Jankowski & Polak, 1996.*Clinical Gene Analysis and Manipulation*.
5. Robinson and Linden, Clinical Genetics Handbook. (latest edition)
6. F Vogel A.G. Motulusky. Human Genetics: Problems and Approaches. Second Completely Revised Edition, Springer-Verlag. (latest edition)
7. Golder N. Wilson, M.D., Ph.D.Clinical Genetics-A Short Course. A John Wiley and Sons, Inc., Publication. (latest edition)

HGL.513: Basics of Microscopy **Credits Hours: 2**

Course Objectives: Microscopes are an important and essential instrument in a Laboratory. The course aims to provide basic understanding of the working of a microscope.

Unit: 1 **18 Lectures**

Basic concepts of microscopy: Magnification; Resolution and resolving powers of different microscope; Field number; Identification of parts of light microscope; visualization of cells and subcellular components by light microscopy, microscopy of living cells; image processing methods in microscopy.

Unit: 2 **18 Lectures**

Principles of Fluorescence and Fluorescence Microscopy

Electron microscopy: Scanning and Transmission electron microscope. Different fixation and staining techniques for EM, freeze-etch and freeze-fracture methods for EM.

Suggested Reading:

1. Suzanne Bell and Keith Morris (2009). *An Introduction to Microscopy*. CRC Press., Boca Raton, FL 33487, USA
2. Kiernan J.A., I. Mason (2002). *Microscopy and Histology for Molecular Biologists: A User's Guide*. Portland Press.
3. A. Méndez-Vilas (2009). *Microscopy: advances in scientific research and education*. Formatex Research Center
4. A. Mendez-Vilas (2012). *Current microscopy contributions to advances in science and technology*. Formatex Research Center.

5. Prakash Singh Bisen and Anjana Sharma (2012). *Introduction to Instrumentation in Life Sciences*. CRC Press taylor and francis
6. Rafael Yuste (2011). *Imaging: A Laboratory Manual*. Cold spring Harbor Laboratory Press

HGL.514: Concepts of Immunogenetics **Credits Hours: 2**

Course Objectives: This course is of interest as most of the recent lifestyle related and inherited diseases are immune mediated. Knowledge of Immunogenetics will improve the understanding of the genetics focused to immune mediated traits. Study of this course will update student's concepts about regulation of immune responses and built basis for interdisciplinary idea for translational research.

Unit: 1 **18 Lectures**

Introduction to Immunogenetics: Overview of human immune system: Types of immune system, component of immune system, immune cells and organs; HLA and non-HLA genes; Tissue specificity and expression pattern of immune genes, T-cell and B-cell mediated immune response, autoimmunity and tissue inflammation, immune genes and common complex diseases: Rheumatoid arthritis, Celiac disease, Inflammatory bowel diseases, Psoriasis, Multiple sclerosis. Immune diseases and gut microbiota.

Unit: 2 **18 Lectures**

Diagnosis, Treatment and management: Basic diagnosis methods; Basic treatment regime; pharmacogenomics of common drugs; concept of modern therapy: pre-prescription screening, community medicine and personalized medicine; Disease management and rehabilitation.

Suggested readings:

1. Strachan T & Read A (2010): Human Molecular Genetics, 4th Edition (Garland Science)
2. Korf B & Irons M (2012): Human Genetics and Genomics, 4th Edition (Wiley-Blackwell)
3. Gangane S.D (2012): Human Genetics, 4th Edition (Elsevier)
4. Haines J.L &Pericak-Vance MA (2006) : Genetic analysis of complex disease, 2nd Edition (Wiley-Liss)
5. Dang HW, Shen H & Liu Y (2007): Current topics in Human Genetics, 1st Edition (World Scientific Publishing Co.)

HGL.515: Gene, Genome and Genomics **Credits Hours: 2**

Course Objective: Understanding the complexity of human genome will provide information to the students that how human system works at molecular level. It will be helpful in understanding the molecular mechanism at system level and how the body functions in health and illness.

Unit: 1 **18 Lectures**

Genes & Genomes: DNA as genetic material, Double helical structure and semiconservative nature of DNA, Prokaryotic and eukaryotic genomes, Organelle genomes, Organisation of genomes, Chromatin, Chromosomes, Polytene chromosomes, Telomeres, DNA replication,

Exons & introns, Transcription, Reverse transcription, Splicing, Translation, Regulation of gene expression.

Unit: 2 **18 Lectures**

Genomics: Genetics engineering, Sequencing and mapping of genomes, Human Genome Project, Human genome variations, High throughput sequencing technologies and their implications, Functional and translational genomics, Pharmacogenomics and personalized medicine.

Suggested Readings:

1. Jeremy W. Dale, Malcolm von Schantz (2002). From Genes to Genomes: Concepts and Applications of DNA Technology. John Wiley & sons Ltd. UK
2. Alberts, B., Bray, D., Lews, J., Raff, M., Roberts, K. and Watson, J.D. (2010). *Molecular Biology of the cell*. Garland publishers, Oxford.
3. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2010). *Biochemistry*. W.H. Freeman & Company. USA.
4. Nelson, D. and Cox, M.M. (2008). *Lehninger Principles of Biochemistry*. BI publications Pvt. Ltd. Chennai, India.
5. Snusted, D.P., Simmons, M. J. (2010). *Principles of Genetics*. John Wiley & Sons, New York.
6. Jocelyn, E.K., Elliott, S.G., Stephen, T.K. (2009).*Lewin's Genes X*. Jones & Bartlett Publishers, USA.

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SEMESTER II

S.No	Paper Code	Course Title	L	T	P	Cr
		Core courses				
3	LSL.521	Human Physiology	3	-	-	3
4	LSP.522	Human Physiology	-	-	1	1
5	LSL.523	Essentials of Immunology	3	-	-	3
6	LSL.524	Advanced Techniques in Human Genetics and Molecular Medicine	3	-	-	3
7	HGS.599	Seminar		-	1	1
		Elective course I (choose any one)				
8	HGL.525	Human Embryology and Developmental Biology	3	-	-	3
9	LML.525	Regenerative Medicine and Stem cell Therapies	3	-	-	3
		Elective Courses 2(choose any one course)				
10	HGL.526	Population Genetics and Genetic Epidemiology	4	-	-	4
11	LML.526	Molecular and Cellular Oncology	4	-	-	4
12	LML.527	Molecular Endocrinology and Signal Transduction	4	-	-	4
	.XXX	**Interdisciplinary Elective Course-1 (choose from other centre)**	2	-		2
			18	-	**2**	**20**
Interdisciplinary courses offered to students of other centre						
13	HGL.527	Prenatal Diagnosis and Genetic Counseling	2	-	-	2
14	HGL.528	Introduction with Population Genetics	2	-	-	2
15	HGL.529	Genetic Epidemiology	2	-	-	2
16	HGL.530	Aging and associated diseases	2	-	-	2

L: Lectures. T: Tutorial, P: Practical, Cr: Credit.

LSL.521: Human Physiology **Credit Hours: 3**

Course Objectives: This course is designed to provide students with an understanding of the function and regulation of the human body and physiological integration of the organ systems to maintain homeostasis. Course content will include neural & hormonal homeostatic control mechanisms, as well as study of the musculoskeletal, circulatory, respiratory, digestive, urinary immune, reproductive, and endocrine organ systems.

Unit: I **17 Lectures**

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

Epithelial Barrier Function, Regulation of Swallowing and Gastric Emptying and Small/ Large Bowel. Gastro-intestinal Secretions and accessory glands

Respiratory system: Anatomical considerations, Transport of gases, Exchange of gases, Waste elimination, Neural and chemical regulation of respiration. Alveolar Ventilation, Diffusion Across Alveoli. Transport of Respiratory Gases in Blood. The Respiratory System Under Stress: Altitude, Hypoxia

Excretory system: Comparative physiology of excretion, Kidney, Urine formation, Urine concentration, Waste elimination, Micturition, Regulation of water balance, Blood Volume, Blood pressure, Electrolyte balance, Acid-base balance. Renal Function and Hemodynamics

Unit: 2 **17 Lectures**

Muscle Physiology: Types of muscles, Properties; Contractile force; Motor Unit. Skeletal, cardiac and smooth Muscle Mechanics & Metabolism.Control of Body Movement.

Cardiovascular system: Comparative anatomy of heart structure, Myogenic heart, specialized tissue, ECG – its principle and significance, Cardiac cycle, Heart as a pump, blood pressure, neural and chemical regulation of all above, Blood corpuscles, Blood cell synthesis and Bone marrow, Haemopoiesis and formed elements, Plasma function, Blood volume, Blood volume and its regulation, Blood groups, Haemoglobin, Immunity, Haemostasis.

Unit: 3 **12 Lectures**

Nervous system: Neurons, action potential, Gross neuroanatomy of the brain and spinal cord, Central and peripheral nervous system, Neural control of muscle tone and posture.

Sense organs: Vision, hearing and tactile response.

Thermoregulation and stress adaptation: Comfort zone, Body temperature – physical, chemical, Neural regulation, Acclimatization

Unit: 4 **8 Lectures**

Endocrinology: Endocrine glands, Hormone Structure and Function, Basic mechanism of hormone action, Hormones and diseases, Reproductive processes, Neuroendocrine regulation. Hormone Receptors and Intracellular Signaling.

Suggested readings:

1. Brody, T. (1998). *Nutritional biochemistry*. Academic Press, USA.
2. Devlin, T.M. (2005). *Textbook of Biochemistry with clinical correlations*. John Wiley & Sons Inc. USA.
3. Guyton. (2007). *Textbook of medical physiology*. 11th Edition. Elsevier India Pvt. Ltd. New Delhi.
4. Hill, R.W, Wyse, G. A. and Anderson, M. (2008). *Animal physiology*. Sinauer Associates Inc. USA.
5. Khurana. (2006). *Textbook of medical physiology*. Elsevier India Pvt. Ltd.
6. Murray, R.K. (2009). *Harper's illustrated biochemistry*. Jaypee Publishers, New Delhi, India.
7. Tyagi, P. (2009). *A textbook of Animal Physiology*. Dominant Publishers and distributors, New Delhi, India.
8. Silverthorn D, (2011) *Human Physiology*, Pearson; 6th edition.
9. Sherman V. (2013) *Vander's Human Physiology*. McGraw-Hill 13th edition.

LSP.522: Human Physiology – Practical Credit Hours: 1

1. Determination of hemoglobin in the blood by various methods.
2. Measurement of Blood Pressure, Pulse rate and Heart rate.
3. Digestive enzymes analysis.
4. Respiratory function: Tidal volume.
5. Sense organs and muscle reflexes.
6. Urine analysis.
7. Blood glucose estimation.
8. RBC, WBC count from human blood.
9. Extraction and estimation of acid phosphatases from serum.
10. Electrophoresis of egg proteins.

*Practical will be conducted depending upon the faculty/facilities.

LSL.523: Essentials of Immunology Credit Hours: 3

Course Objectives: The objective of this course is to cover basic concepts of immune system and to understand the concept of immune-based diseases as either a deficiency of components or excess activity as hypersensitivity.

Unit:1 9 Lectures

Immune system: Cells and organs of the immune system. Humoral and cellular components of the immune system, Innate & adaptive immunity, Antigens, antigenicity vs immunogenicity. Antigen processing and presentation, Structure, function, classes and subclasses of immunoglobulins,MHC. Primary and secondary immune response.

Unit:2 9 Lectures

Immune Effectors: Complement system, their structure, functions and mechanisms of activation by classical, alternative and lectin pathway. Th1 and Th2 response, cytokines, Chemokines.Antigen and antibody interactions.

Unit: 3 9 Lectures

Mechanisms of Immune System Diversity: Organization and expression of immunoglobulin genes,Mechanisms of antibody diversity, class switching. Structure and functions of Major Histocompatibility Complex (MHC) and Human Leukocyte Antigen (HLA) system, polymorphism, distribution, variation and their functions. Organization and rearrangement of T-cell receptor genes (TCR).

Unit: 4 9 Lectures

Immune System in Health and Diseases: Inflammation, hypersensitivity and autoimmunity, Immunity to microbes, immunity to tumors, AIDS and immunodeficiencies, hybridoma technology and vaccine development for diseases like AIDS, cancer and malaria.Production, characterization and applications of monoclonal antibodies in diagnosis, therapy and basic research, concept of making immunotoxins.

Suggested Reading:

1. Kindt, T.J., Osborne, B.A. and Goldsby, R.A. (2007). *Kuby Immunology* .7th Edition. W.H. Freeman, USA.
2. Abbas. (2008). *Cellular and Molecular immunology*. CBS Publishers & Distributors, India.
3. Charles, A. and Janeway, J.R. (1994). *Immunobiology: The immune system in health and disease*. Blackwell Publishing, USA.
4. Delves, P.J., Roitt, I.M. and Seamus, J.M. (2006). *Roitt's essential immunology (Series-Essentials)*. Blackwell Publishers, USA.
5. Elgert, K.D. (2009). *Immunology: Understanding the immune system*. Wiley-Blackwell, USA.
6. Paul, W.E. (1993). *Fundamental immunology*. Raven Press, SD, USA.
7. Sawhney, S.K. and Randhir, S. (2005). *Introductory practical biochemistry*. Alpha Science International Ltd. New Delhi, India.
8. Tizard. (2008). *Immunology: An Introduction*. Cengage Learning, Thompson, USA.

LSL.524: Advanced Techniques in Human Genetics and Molecular Medicine Life Sciences

Credit Hours: 3

Course Objectives: This course will help the students to understand safe laboratory practices and basic molecular biology techniques and specialized molecular and cell biology techniques.

Unit 1 — **9 Lectures**

Biochemical Techniques: Sterilization techniques; Spectrometry; Colorimetry, Mass, UV, IR, NMR and atomic absorption spectrophotometery; Centrifugation: Principle and applications, Ultracentrifugation. Chromatography: Principle, procedure and applications of thin layer chromatography (TLC), gel filtration and ion exchange, affinity chromatography, GC, GLC, HPLC and FPLC.

Unit:2 — **9 Lectures**

Microscopy: Light microscopy, phase contrast microscopy, fluorescent microscopy, scanning electron microscopy (SEM/FESEM), transmission electron microscopy (TEM), micrometry and photomicrography, Histochemistry, Scanning-probe microscopy, Atomic force microscopy, CLSM.

Unit:3 — **9 Lectures**

Nucleic acids: Isolation, purification and analysis of nucleic acids. Electrophoresis: Principle of gel electrophoresis, polyacrylamide gel electrophoresis (PAGE and SDS-PAGE), agarose gel electrophoresis, pulse field gel electrophoresis (PFGE) and 2-Dimensional gel electrophoresis. Polymerase chain reaction (PCR): Principle, types and applications, PCR based markers: RAPDs, SSRs, SNPs, ISSRs, and SCARs etc. Blotting techniques: Southern, Northern, Western, Dot blotting and hybridization, DNA fingerprinting.

Unit:4 — **9 Lectures**

Flow Cytometry: Cell sorting, Hybridoma technology/Production of antibodies, Histochemical and Immunotechniques, Immunochemical Techniques, Developing Monoclonal and Polyclonal antibodies, Immunocytochemistry, Radioimmunoassay (RIA), Enzyme Linked Immunosorbent Assay (ELISA) and Autoradiography. **Mutation Analyses Techniques:** Restriction mapping, SSCP analyses, DNA sequencing-manual and automated methods. **Cell and tissue culture techniques:** Plants and animals.

Suggested Reading:

1. Brown, T.A. (2010). *Gene cloning and DNA analysis: An Introduction*. 6th Edition, Wiley-Blackwell Publisher, New York.
2. Goldsby, R.A., Kindt, T.J. and Osborne, B.A. (2008). *Kuby Immunology*. 6th Edition, W H. Freeman & Company, San Francisco.
3. Gupta, P.K. (2005). *Elements of biotechnology*. Rastogi Publications, Meerut.
4. Gupta, S. (2005). *Research methodology and statistical techniques*, Deep & Deep Publications (P) Ltd.New Delhi.
5. Kothari, C.R. (2008.) *Research methodology(s)*. New Age International (P) Ltd., New Delhi
6. Lewin, B. (2010). *Genes X*, CBS Publishers & Distributors. New Delhi.
7. Mangal, S.K. (2007). *DNA Markers In Plant Improvement*. Daya Publishing House,New Delhi.
8. Nelson, D. and Cox, M.M. (2009). *Lehninger Principles of Biochemistry*. W.H. Freeman and Company, New York.
9. Primrose. S.B. and Twyman, R. (2006). *Principles of Gene Manipulation and Genomics*. Blackwell Publishing Professional, U.K.
10. Sambrook, J. (2006). *The Condensed Protocols from Molecular Cloning: A Laboratory Manual*. Cshl Press. New York.
11. Sambrook, J. and Russell, D.W. (2000). *Molecular Cloning: A Laboratory Manual* (3 Vol-set). 3rd Edition, CSHL Press, New York.
12. Sawhney, S.K. and Singh, R. (2005). *Introductory Practical Biochemistry*. Narosa Publishing House, New Delhi .
13. Slater, A., Scott, N.W. and Fowler, M.R. (2008). *Plant Biotechnology: The Genetic Manipulation of Plants*. Oxford University Press, USA.
14. Wilson, K. and Walker, J. (2006). *Principles and Techniques of Biochemistry and Molecular biology*. 6th Edition, Cambridge University Press India Pvt. Ltd., New Delhi.

Elective courses

HGL.525: Human Embryology and Developmental Biology **Credit Hours: 4**

Course Objectives: The course aims to make students familiar with the embryonic and other developmental processes.

Unit: I **18 Lectures**

Reproductive Physiology: Structure and Functions of Adult Human Reproductive organs. Reproductive Endocrinology,Gametogenesis: Formation of male and female gametes. Embryogenesis: Fertilization, Gastrulation and Implantation of Embryo, Lactation.

Unit: 2 **18 Lectures**

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

Unit: 3 **18 Lectures**

Regulation of Organ Development: Genetic and molecular control of development of limbs, Gastrointestinal system and cardiovascular system; Genetics of sex determination in humans and development of urogenital system; Programmed cell death and role of cell death in formation of digits and joints, Genetic and molecular control of development of head and neck region.

Unit: 4 **18 Lectures**

Post-natal Development, Aging and senescence: Environmental and genetic factors during maturations, Sex linked changes, Deciduous *and* primary teeth, Cognitive development ageing: its causes and regulation; Clinical death.

Suggested reading:

1. Green, D. R. & Reed J. C. (2010). *Apoptosis: Physiology and Pathology*. Cambridge press, UK.
2. Milunsky, J. &Milunsky, A. (2010). *Genetic Disorders and the Fetus: Diagnosis, Prevention & Treatment*. Willey Blackwell India, New Delhi.
3. Nussbaun, R., Roderick, R. M. and Huntington, F.W.(2007). *Genetics in Medicine*. Saunders Elsevier Philadelphia.
4. Prakash, G. (2007). *Reproductive Biology*. Narosa Publication House Pvt Ltd., New Delhi.
5. Sadler, T.W., Tosney, K., Chescheir, N.,C., Imseis, H., Leland, J. and Sadler-Redmond, S.,L. (2011).*Langman's Medical Embryology (Longmans Medical Embryolgy)*. Lippincott Williams and Wilkins.
6. Schaefer, B.*D. (2013). Medical Genetics: An integrated Approach*. McGraw Hill Education, New Delhi.
7. Tyagi R. (2011). *Understanding Evolutionary Biology*. Discovery Publication House Pvt. Ltd.. New Delhi.

LML.525: Regenerative Medicine and Stem Cell Therapies **Credit Hours:4**

Learning Objective: To teach students the advanced techniques in medicine in gene and molecular therapeutics. The students will understand basic stem cell biology and corresponding requirement for tissue engineering.

Unit: 1 **16 Lectures**

Stem Cells: Stem cells and their properties, classification of stem cells: Hematopoietic Stem Cells, mesenchymal Stem Cells, Embryonic Stem Cells, Fetal Stem Cells, adult stem cells,

cancer stem cells, *In-vitro* culture techniques, isolation, identification and characterization of stem cells, stem cells in gastrointestinal , liver, pancreas, kidney, heart, spinal cord, eye diseases and cancer.

Unit: 2 **16 Lectures**

Tissue Engineering: Principles of tissue culture, tissue and organ culture, extracellular matrices, bioreactors, ethical issues related to stem cell therapies, stem cell banks, bone marrow transplantation.

Unit: 3 **20 Lectures**

Regenerative Medicine: Modes of tissue and organ delivery, tissue Engineering and transplantation techniques, immunoisolation techniques, regeneration of bone and cartilage, Islet cell transplantation and bioartificial pancreas, lung regeneration

Unit: 4 **20 Lectures**

Somatic and Germline Engineering: Basics of cell culture and media, Culturing primary cells and cell lines, suspension and adherent cultures, cell growth, growth inhibition and apoptotic studies, Embryo culture, transplantation and teratogenesis, teratomas. Stem cell culture, organ culture, artificial blood, Somatic cell fusion and somatic cell genetics, radiation hybrids.

Suggested Reading:

1. Lanza, R., Gearhart,J. (2009). *Essential of Stem Cell Biology*. Elsevier Academic Press.
2. Lanza, R., Klimanskaya, I. (2009). *Essential Stem Cells Methods*. Academic Press.
3. Mao, J. J., Vunjak-Novakovic (2008). *Translational Approaches in Tissue Engineering & Regenerative Medicine*. Artech House INC Publications.
4. Lanza, R. (2007). *Principles of Tissue Engineering, 3rd Edition*. Academic Press.
5. Stein. (2011). *Human Stem Cell Technology and Biology: A Research Guide and Laboratory Manual*. Wiley-Blackwell.
6. Lanza, R. (2004). *Handbook of Stem Cells, Two-Volume Set: Volume 1-Embryonic Stem Cells; Volume 2-Adult & Fetal Stem Cells*. Academic Press.

Related Weblinks:

1. www.stemcells.wisc.edu
2. http://stemcells.nih.gov/info/scireport/Pages/2006report.aspx
3. *stemcells.nih.gov/*
4. http://instem.res.in/

HGL.526 Population Genetics and Genetic Epidemiology **Credit Hours: 3**

Course Objectives:

Study of population genetics is necessary to understand the evolution. This course will be helpful to the students to conceptualize the existence of genetic variation and speciation. Further, this course will give students exposure towards understanding population health and disease susceptibility.

Unit: 1 **18 Lectures**

Population dynamics and Fundamental of Epidemiology: Dynamics and conditions of the Hardy-Weinberg law; Selection coefficient and fitness; Heterozygous advantages, Inbreeding and its consequences; Mutation pressure and estimation of rates, Genetic load, Selection coefficient and Fitness, Dynamics of migration and genetic drifts; Construction of Pedigree and Pedigree analysis.

Unit: 2 **12 Lectures**

Introduction of different types of epidemiological studies: Experimental and observational; Cohort studies; Association studies, genome-wide association studies (GWAS), general approaches to access the genetic basis of disease; heritability; basic parameters of epidemiology: frequency, occurrence, prevalence, Incidence; Association; variation;

Unit: 3 **12 Lectures**

Population and speciation: Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; convergent evolution; sexual selection; co-evolution.

Unit: 4 **12 Lectures**

Genetic variation and Inheritance of complex traits: Basics of genetic variation, Genetic markers – SNP, CNV, Indels, VNTR, STR, Microsatellite. Tag markers and Haplotypes, Linkage disequilibrium, Fixation index; Quantitative Genetic analysis; Broad-Sense Heritability and Narrow-Sense Heritability.

Suggested reading:

1. Bhasker, H.V. and Kumar S (2008). *Genetics*. Campus Books International, New Delhi, India.
2. Cavalli-Sforza, L.L. and Bodmer, W.F. (2013). *The Genetics of Human Populations*. Dover Publications.
3. Hamilton M.B. (2009). *Population Genetics*. Wiley-Blackwell, UK.
4. Hedrick P.W.(2011). *Genetics of Populations*. Jones and Bartlett Publishers, Massachusetts.
5. Jobling, M., Hollox, E., Hurles, M., Kivisild, T. and Tyler-Smith, C. (2013). *Human Evolutionary Genetics*. Garland Science.
6. Knight, J.C. (2009). *Human Genetic Diversity –Functional consequences for Health and Disease*. Oxford University Press, USA.
7. Krebs, J.E, Goldstein, E.S. and Kilpatrick, S.T. (2013) *Lewin's Essential Genes*. Jones and Bartlett learning, USA.
8. Nielsen, R. and Slatkin, M. (2013). An Introduction to Population Genetics: Theory and Applications. Sinauer Associates, Inc.
9. Relethford, J.H; (2012). *Human Population Genetics*. John Wiley & Sons.
10. Snusted, D.P., Simmons, M. J. (2010). *Principles of Genetics*. John Wiley & Sons, New York.
11. Palmer LJ, Burton PR & Smith GD (2011). *An introduction to genetic epidemiology* (Policy Press, University of Bristol)
12. Dawn TM (2011). *Genetic Epidemiology* (Springer)
13. Austin M (2013). *Genetic Epidemiology: Methods and Applications*, 1st Edition (CABI Publishing)

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LML.526: Molecular and Cellular Oncology — Credit Hours:4

Course Objectives: Cancer Biology course is designed as an elective course to equip the students of different streams of Life Sciences with a conceptual understanding and advanced comprehension to cope up with the ever-expanding role of molecular biology in basic cancer research as well as clinical oncology.

Unit: 1 — 18 Lectures

Fundamentals and Genetics of Cancer: History, hallmarks of cancer research, cancer classification, Mutagens, carcinogens and gene mutations and genetic arrangements in progenitor cells. Chromosomal aberrations, tumor viruses and discovery of oncogenes, Mechanism of activation of oncogenes. Transcription factors as tumor suppressors and oncogenes, Familial cancer syndromes, telomere regulation in cancer, micro RNA profiling in cancer, cancer stem cells.

Unit: 2 — 18 Lectures

Signal transduction in cancer progression: Role ofgrowth factors and receptors in carcinogenesis, Interaction of cancer cells with variety of immune cells. Deregulation of Cell cycle in cancer. Role of p53 and pRb in cell cycle, Apoptosis and tumor suppressor p53, mitochondrial signaling, RAS signaling in cancer, cancer metabolism, hypoxia and metastasis, angiogenesis, tumor microenvironment. DNA damage and repair mechanisms, DNA repair defects and their relation to cancer.

Unit: 3 — 18 Lectures

Cancer Detection: General and organ specific symptoms associated with cancer, techniques for cancer detection, biomarkers for cancer detection of various stages of cancer, population genetics based screening methods, *In-vitro* assays to detect angiogenesis, metastasis, cell proliferation, mice models to study cancer (transgenic, knock-out, knock-in, xenografts and patient derived xenografts), genomic and proteomic approaches to develop better cancer markers.

Unit: 4 — 18 Lectures

Cancer Therapies and Recent Advances in Cancer Research : TraditionalChemotherapies, radiotherapy, Onco-surgery, Bone marrow transplantation, stem cell therapies, Immunotherapy, combinational therapies, natural products as therapeutics, cancer vaccines, gene therapies and delivery vehicles, targeted anticancer therapies, monoclonal antibody & adjuvant therapies. System biology approaches, Application of new technologies in prevention, assessing risk, diagnostics and treatment.

Suggested Reading:

1. Airley, R. (2010). *Cancer Chemotherapy: basics to clinic.* Willey-Blackwell publishing, New Jersey.
2. DeVita, V. T., Hellman, S., Rosenberg, S. A. (2011). *Cancer: principles and practice of oncology.* Lippincot Williams and Wilkins publishers, Philadelphia.

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3. Enders, G. H. (2010). Cell *cycle deregulation in cancer*. Humana Press, Springer science, New York.
4. Grutzmann, R., Pilarsky, C. (2010). *Cancer gene profiling: methods and protocols*. Humana Press, Springer science, New York.
5. Gusev, Y. (2010). *Micro RNA profiling in cancer*. Pan Standford publishing pvt.Ltd., Singapore.
6. Hiem, S., Mitelman, F. (2009). *Cancer cytogenetics*. IIIrd edition. Willey-Blackwell publishing, New Jersey.
7. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009). *Lewin's Gene X*. Jones &Barlett.
8. Wang, E. (2010). *Cancer systems biology*. CRC press, Taylor & Francis group, New York.
9. Weinberg, Robert A. (2007). *The Biology of Cancer*. New York: Garland Science
10. Prasad, K. N. (2009). Bio-Shield, *Antioxidants against Radiological, Chemical and Biological Weapons*, Strategic Book Publishing, USA.
11. Washington, C. M. and Leaver D. T. (2009). *Principles and Practice of Radiation Therapy*, Elsevier Health Sciences, USA.

LML.527: Molecular Endocrinology and Signal Transduction **Credit Hours: 4**

Course Objectives: The course is designed for the students of life sciences who are interested to learn the basics of signal transduction and its role in various cellular processes. Various pathways deregulated during disease manifestation will also be discussed in detail.

Unit: 1 **16 Lectures**

Introduction to signal transduction, basics of cell signaling, types of signaling, signaling molecules and their classification, signal receptors types and subtypes, hormonal signaling, role of biological membranes in signaling, ion channels and other types of receptor channels, G and non G protein receptors, second messengers and effector molecules, mechanism of protein activation/inactivation, various signaling pathways: MAPK, PI3K, MEK, Ras/Raf signaling,TGF beta, NFkB etc.

Unit: 2 **18 Lectures**

Regulation of cell cycle, cell division, proliferation, apoptosis via signal transduction, Signal transduction pathways during embryonic development, cellular differentiation and de-differentiation, epithelial to mesenchymal transition, cytoskeleton proteins and signal transduction.

Unit: 3 **18 Lectures**

Signal transduction in human diseases: Deregulated cell signaling in diabetes, cancer, cardiovascular diseases, genetic and metabolic disorders, Ageing and free radical stress biology, neuronal diseases, blood borne disorders and infectious diseases.

Unit: 4 **20 Lectures**

Nuclear Receptors in Health and Disease: Nuclear Receptor superfamily: an introductory overview; structural and functional domains of nuclear receptors; ligand-mediated regulation of

nuclear receptor function; nuclear receptor localization; receptor-ligand interactions and gene transcription regulation; co-activators and co-repressors; SRC/ p160, CBP/p300, histone (acetylase, deacetylase, methylase, demethylase), ATP dependent chromatin remodellers; receptor regulation by post-translational modifications e.g. phosphorylation, sumoylation, ubiquitination, acetylation, deacetyation, methylation etc.; nuclear receptors as drug targets; xenobiotic receptors and drug metabolism; screening and analysis of therapeutic ligands by high - throughput microscopy, co-transfection and transcriptional assays; steroid hormones and their receptors; molecular basis of endocrinopathies: endocrine-related cancers (prostate, breast, endometrial cancers); ligand-independent transcriptional activation of steroid hormone receptors; endocrine disruptors and selective steroid receptor modulators; current concepts and future challenges.

Suggested Reading:

1. Alberts, B. Bray, D. Lews, J., Raff, M., Roberts, K. and Watson, J.D. (2010). *Molecular Biology of the Cell*. Garland publishers, Oxford.
2. Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. John Wiley & Sons. Inc., New Delhi, India.
3. Cooper GM. (2000). *The Cell: A Molecular Approach*. 2nd edition.Sunderland (MA): Sinauer Associates.
4. Lodish H, Berk A, Zipursky SL, et al. (2000). Molecular Cell Biology. 4th edition.New York: W. H. Freeman.
5. Robertis,E.D.P.D.E and Robertis,E.M.F.De. (2011). Cell and Molecular biology. Lippincott Williams & Wilkins
6. Nelson and Cox, Lehninger Principles of Biochemistry 5e W H Freeman & Co (2009) ISBN: 978-0-716-77108-1
7. Liciniio, J., Wong, M. L. (2003). Pharmacogenomics: The Search for Individualized Therapies. Wiley-VCH Verlag GmbH & Co. KGaA.
8. Kramer, I., Gomperts, B., Tatham, P. (2009). Signal Transduction, 2nd Edition, Academic Press.
9. Sitaramaya, A. (2010). Signal Transduction: Pathways, Mechanisms and Diseases. Springer

Interdisciplinary Courses offered to students of other centre

HGL.527 Prenatal Diagnosis and Genetic Counseling **Credit Hours: 2**

Course Objectives: The course gives and overview about the various techniques of prenatal diagnosis and the strategies to console the patient and their families.

Unit-1 14 Lectures

Prenatal Diagnosis: Indications for Prenatal Diagnosis, Preliminaries to Prenatal Diagnosis, Procedures for Obtaining Fetal Tissue, Ultrasonography, Laboratory Studies, Psychosocial issues.

Unit-2 14 Lectures

Genetic Counseling: History taking,Examination,Genetic Counseling in Clinical Genetics, Determining Recurrence Risks, Population Screening for Genetic Diseases, Reproductive decision making

Suggested readings:

1. Peter Snustad and Michael J Simmons(2009). Principles of Human Genetics. Fifth Edition. John Wiley & Sons, Inc.
2. Strachan T and Read A 2010 Human Molecular Genetics, Fourth Edition. Taylor and Francis
3. Ricki Lewis (2009) Human Genetics-Concepts and Application. Ninth Edition. McGraw-Hill College Publishers

HGL.528: Introduction with Population Genetics **Credit Hours: 2**

Course Objectives: The course gives an overview about the basic principles of population genetics and different evolutionary forces acting on a population.

Unit-I **18 Lectures**

Hardy-Weinberg Equilibrium: Historical emergence, Application and subdivisions of human population genetics, Dynamics and conditions of the Hardy-Weinberg law and its application for autosomal locus with two alleles and multiple alleles, Testing of Hardy-Weinberg proportion, Selection coefficient and fitness, Heterozygous advantages, Inbreeding and its consequences.

Unit-II **18 Lectures**

Kinetics of changes of Gene Frequencies: Non-recurrent and recurrent mutation, mutation pressure and estimation of rates, Genetic load, Selection coefficient and fitness, Heterozygous advantages, Equilibrium between mutation and selection, Dynamics of migration and genetic drifts

Suggested readings:

1. Bhasker, H.V. and Kumar S (2008). *Genetics*. Campus Books International, New Delhi, India.
2. Cavalli-Sforza, L.L. and Bodmer, W.F. (2013). *The Genetics of Human Populations*. Dover Publications.
3. Hamilton M.B. (2009). *Population Genetics*. Wiley-Blackwell, UK.
4. Hedrick P.W.(2011). *Genetics of Populations*. Jones and Bartlett Publishers, Massachusetts.
5. Jobling, M., Hollox, E., Hurles, M., Kivisild, T. and Tyler-Smith, C. (2013). *Human Evolutionary Genetics*. Garland Science.
6. Knight, J.C. (2009). *Human Genetic Diversity –Functional consequences for Health and Disease*. Oxford University Press, USA.
7. Krebs, J.E, Goldstein, E.S. and Kilpatrick, S.T. (2013) *Lewin's Essential Genes*. Jones and Bartlett learning, USA.
8. Nielsen, R. and Slatkin, M. (2013). An Introduction to Population Genetics: Theory and Applications. Sinauer Associates, Inc.
9. Relethford, J.H. (2012). *Human Population Genetics*. John Wiley & Sons.

10. Snusted, D.P., Simmons, M. J. (2010). *Principles of Genetics*. John Wiley & Sons, New York.

HGS.529: Genetic Epidemiology **Credit Hours: 2**

Course Objectives: This is much applied course directly related to understand the population health. This course would help in building student's aptitude towards designing population based research studies. This course will complement and complete the knowledge of genetics and leads it to translational research.

Unit-I **8 Lectures**

Fundamentals of epidemiology: Process of genetic epidemiology; general approaches to access the genetic basis of disease; Basics of population genetics; Mendel's laws (segregation, assortment); aggregation; heritability; basic concepts of epidemiology: frequency, occurrence, prevalence, Incidence; Hardy-Weinberg equilibrium; Association; variation; population bottleneck and founder effects;

Unit-II **18 Lectures**

Methods and techniques: Introduction of different types of epidemiological studies: Experimental and observational;Cohort studies; Association studies, Mendelian and non-Mendelian pattern of inheritance;

Suggested readings:

1. Palmer LJ, Burton PR & Smith GD (2011): An introduction to genetic epidemiology (Policy Press, University of Bristol)
2. Dawn TM (2011): Genetic Epidemiology (Springer)
3. Austin M (2013): Genetic Epidemiology: Methods and Applications, 1st Edition (CABI Publishing)
4. Ziegler A and Konig IR (2010): A statistical Approach to Genetic Epidemiology, Concepts and Applications. Wiley-Blackwell.

HGL.530: Aging and associated diseases **Credit Hours: 2**

Course Objective: Aging is a complex biological process and a critical risk factor for a variety of human pathologies. This course make students to understand the causal underlying cellular and molecular processes that deteriorates with age.

Unit-I **8 Lectures**

Mechanisms of Aging: Overview and symptoms of aging,DNA damage and repair, cellular senescence and apoptosis, sirtuins and deacetylases, hormones, glycation, protein damage, attenuated immunity, inflammation, accumulation of toxins and garbage in aging, Mechanisms affecting aging due to calorie restriction, insulin signalling, mitochondria and telomerase. Longevity genes and biomarkers of aging, Cancer and aging.

Unit-II **18 Lectures**

Age associated diseases: Atherosclerosis and cardiovascular diseases, Cancer, Arthritis, cataract osteoporosis, type 2 diabetes, hypertension and Alzheimer's disease.

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Suggested readings:

1. *Edward J. Masoro and Steven N. Austad* (2011). Handbook of the biology of aging. 7th Edition. Academic Press, USA.
2. Jan Vijg (2007). Aging of the Genome: The Dual Role of DNA in Life and Death. 1st Edition. Oxford University Press, UK.
3. Surish Rattan (2003). Modulating Aging and Longevity (Biology of Aging and its Modulation). Springer, USA.
4. Thomas von Zglinicki (2003). Aging at the Molecular Level. Springer Science & Business Media. USA.
5. A Macieira-Coelho (2003). Biology of aging. I[st] edition. Springer Verlag Berlin Heidelberg, New York.

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SEMESTER III

S.No	Paper Code	Course Title	L	T	P	Cr
		Core courses				
1	LSL.601	Medical Microbiology	2	-	-	2
2	HGL.602	Biosafety, Bioethics and Intellectual Property Rights	2	-	-	2
3	LSL.603	Bioinformatics and Computational Biology	4	-	-	4
4	HGD.600	Dissertation	-	-	8	8
		Elective course 1 (choose any one)				
5	HGL.604	Genetic Diseases and Therapies	4	-	-	4
6	LML.604	Evolution and Developmental Genetics	4	-	-	4
		Elective courses (choose any one theory along with the respective Practical)				
8	LML.605	Radiation Biology	4	-	-	4
9	HGL.605	Aging, Longevity and Health	4	-	-	4
			16	0	8	24

L: Lectures, T: Tutorial, P: Practical, Cr: Credit.

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LSL.601: Medical Microbiology — Credit Hours: 2

Course Objectives: The student will learn the mechanism of infectious diseases their causes, detection, molecular diagnosis and possible therapeutics.

Unit: 1 — **12 Lectures**

Prokaryotic, Eukaryotic structure and function: Cell structure and function, Classifications. Bacteria, Fungi, Protozoa, Algae, and viruses, Structure of major viruses, and Viral replication.

Unit: 2 — **12 Lectures**

Growth, nutrition & control: Phases in bacterial growth, Growth Curve, Calculation of G-time, Physical and environmental requirements of growth, Microbial nutritional requirements, Types of culture media. Physical and Chemical methods, Antimicrobial drugs, Antibiotic assays, Drug resistance in bacteria.

Unit: 3 — **10 Lectures**

Microbial Genetics: DNA replication, Transcription and translation, Operon, Horizontal Gene Transfer.

Unit: 4 — **20 Lectures**

Applied Microbiology: Environmental microbiology, Microbial ecology, Aquatic microbiology, Food, Dairy and Agricultural Microbiology, Industrial Microbiology. Major bacterial diseases of animals and plants, Airborne, Food-borne, Soil-borne, Nosocomial and Sexually Transmitted/Contagious Diseases, Viral pathogenesis, Major viral diseases: .Avian Influenza A/H5N1, A/H1N1 Swine Influenza, SARS, AIDS, Japanese encephalitis, Malaria, Tuberculosis, West Nile, Mechanisms of emergence and reemergence.

Suggested Reading:

1. Bauman, R.W. (2011). *Microbiology with Diseases by Body System*. Benjamin Cummings, USA.
2. Capuccino, J.G. and Sherman, N. (2004). *Microbiology-A Laboratory Manual*. Benjamin Cummings, USA.
3. Pelczar, M. J., Chan, E.C.S. and Krieg, N.R. (1993). *Microbiology: Concepts and Applications*. McGraw-Hill Inc. USA.
4. Pommerville, J.C. (2010). *Alcamo's Fundamentals of Microbiology*. Jones & Bartlett Publishers, USA.
5. Prescott, L.M., Harley, J.P. and Klein, D.A. (2004). *Microbiology*. McGraw-Hill Science, USA.
6. Strelkauskas, A., Strelkauskas, J. and Moszyk-Strelkauskas, D. (2009). *Microbiology: A Clinical Approach*. Garland Science, New York, USA.
7. Tortora, G.J., Funke, B.R. and Case, C.L. (2009). *Microbiology: An Introduction*. Benjamin Cummings, USA.

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HGL.602: Biosafety, Bioethics and Intellectual Property Rights Credit Hours: 4

Unit: 1 18 Lectures

Biosafety: Good laboratory practices, Biosafety for human Health and Environment. Biosafety issues for using cloned genes in Medicine, Agriculture, Industry, and Ecoprotection. Gene Pollution, Biological Invasion, Risk and Safety Assessment from Genetically Engineered Organisms, Special Procedures for r-DNA based products, Biological Warfare, Biological Containment (BC) and Physical Containment (PC), CDC Biosafety levels, Biosafety in Clinical Laboratories and Biohazard Management.

Unit: 2 18 Lectures

Bioethics: Ethical Theories, Ethical Considerations during Research, Data Manipulations, Subject Consent, Animal Testing. Animal Rights, Perspectives and Methodology, Ethical Issues of the Human Genome Project, Code of Ethics in Medical/clinical laboratories. Healthcare rationing, Ethical Issues of Xenotransplantation, Ethics involved in Embryonic and Adult Stem Cell Research, Ethics in Assisted Reproductive Technologies: animal and human cloning and *In-vitro* fertilization, the element of Informed Consent, Ethical issues in MTP and Euthanasia.

Unit: 3 18 Lectures

Intellectual Property Rights (IPRs): Various forms of IP – Patents, Copyright, Industrial Designs, Trade Secrets, Trade Secrets, Geographical Indications and Plant breeder's right; Fair use, plagiarism and open access publishing; Criticism of intellectual property; Indigenous intellectual property.

Unit: 4 18 Lectures

Patent system in India: Patent filing in India and abroad: Determination of patentability of inventions, filing a patent application in India: timeline, procedure involved in the granting of a patent, various routes of filing patent application abroad, patent co-operation Treaty (PCT);Patenting of Natural and Genetic resources:Gene patent, Patenting of Living Organisms, Traditional knowledge digital library (TKDL).

Suggested Reading:

1. Clarke, A (2012). *Genetic Counseling: Practice and Principles*. Taylor & Francis
2. Fleming, D.O. and Hunt, D.L. (2006). *Biological Safety: Principles and Practices*. American Society for Microbiology, USA.
3. Mahop, M.T. (2010). *Intellectual Property, Community Rights and Human Rights: The Biological and Genetic Resources of Developing Countries*. Routledge.
4. Rockman, H.B. (2004). *Intellectual Property Law for Engineers and Scientists*. Wiley-IEEE Press, USA.
5. Shannon, T.A. (2009). *An Introduction to Bioethics*. Paulist Press, USA.
6. Thompson J and Schaefer, B.D *(2013).Medical Genetics: An Integrated Approach*. McGraw Hill.
7. Vaughn, L. (2009). *Bioethics: Principles, Issues, and Cases*. Oxford University Press, UK.
8. WHO. (2005). *Laboratory BiosafetyManual*. World Health Organization.

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HGL.603 Bioinformatics and Computational Biology — Credit Hour: 4

Course Objectives: Bioinformatics course is being offered to the students as fundamental course to brush up the basics of the students in this important emerging area. Students will be composed to the concepts of data mining, computational and algorithmic tools for biological data analysis and are expected to get a good idea on using computational resources to understand and resolve biological problems.

Unit: 1 — **9 Lectures**

Biological databases: Nucleotide Sequence Databases, GenBank, DDBJ, EMBL, Sequence Flatfile and submission process, Protein sequence databases, UniProt in detail, Mapping databases, Genomic databases, Data mining

Unit: 2 — **9 Lectures**

Sequence analysis: Gene Prediction methods and programs, Promoter analysis, RNA secondary structure thermodynamics, Refining multiple sequence alignment based on RNA secondary structure predictions, SNP discovery methods and databases, Genotyping, International haplotype map project, 1000 genomes project.

Analysis for protein sequences: Predicting features of individual residues, Predicting function, Neural networks, Protein structure prediction, Protein structure databases, PDB in detail, 3D visualization softwares, Pathway and molecular interaction databases.

Unit: 3 — **9 Lectures**

Inferring relationships: Global Vs. local sequence alignments, Dotplots, Scoring matrices, Pairwise sequence alignment, BLAST, Position-Specific scoring and PSI-BLAST, MegaBLAST, BL2SEQ, BLAT, FASTA Vs BLAST, Protein multiple sequence alignments, Multiple structural alignments, Shotgun sequencing, Sequence assembly and finishing.

Unit: 4 — **9 Lectures**

Modelling and structure: From protein sequence to structure, theoretical and practical aspects of protein sequence alignments, secondary, tertiary structure prediction, comparative modeling, Docking, protein-protein and protein-ligand docking. Techniques for 3-D structure determination like X-ray, NMR, MS/MS analysis.

Computational drug designing: Structure-based drug design, virtual screening, quantitative structure activity relations, Cheminformatics and pharmacophore mapping in therapeutic development.

Suggested Reading:

1. Baxevanis, A.D. and Ouellette, B.F.F. (2005). *Bioinformatics: A Practical guide to the Analysis of Genes and Proteins*. Wiley-Interscience, USA.

2. Hall, B.G. (2011). *Phylogenetic Trees Made Easy: A How-To Manual*. Sinauer Associates, Inc. USA.

3. Lesk, A.M. (2008). *Introduction to Bioinformatics*. Oxford University Press, UK.

4. Zvelebil, M. and Baum, J. (2007). *Understanding Bioinformatics*, Garland Science, New York, USA.

5. Ramsden, J. (2010). *Bioinformatics: An Introduction (Computational Biology)*. Springer, India.

6. Ye, S.Q. (2008). *Bioinformatics: A Practical approach*. Chapman & Hall/CRC, UK.
7. Mount, D. (2012). Bioinformatics: Sequence and Genome Analysis. Cold Spring Harbor Laboratory Press
8. Graur, D., Li, W. H. (2000). Fundamentals of Molecular Evolution. Sinauer Associates.
9. Tisdall, J. (2001). Beginning Perl for Bioinformatics. O'Really Publishers.
10. Orengo, C., Jones, D., Thornton, J. (2005). Bioinformatics: Genes, Proteins and Computers (Advanced Texts). Taylor and Francis Publishers.

HGD 600: Dissertation **Credit Hours: 8**

Elective courses

HGL 604: Genetic Diseases and Therapies **Credit Hours: 4**

Course Objectives: The students will become familiar with the various types of genetic disorders and the therapies which although are in the research stage but may emerge as a future treatment method.

Unit 1 **9 Lectures**

Monogenic Disorders: Albinism, Cystic fibrosis, Achondroplasia, Huntington disease. Muscular dystrophy, X-linked rickets

Multifactorial Diseases in man: Diabetes, Celiac disease, Liver cirrhosis, Obesity, Hypertension, Cancer as genetic disease, Cancer-prone syndromes.

Unit: 2 **18 Lectures**

Genomic Imprinting and Human Diseases: Uniparental Disomy & Genomic Imprinting Prader-Willi & Angelman syndromes, Beckwith-Wiedeman syndrome & Silver Russell Syndrome; Imprinting and brain and behaviour; Imprinting and Cancer.

Neurofibromatosis I; X/Y linked Human Syndromes due to Numerical Chromosomal Anomalies

Unit: 3 **18 Lectures**

Genetic Screening: Risk calculations, Population screening for genetic disease-adult, Clinical utilization of presymptomatic and predispositional testing, Presymptomatic testing for genetic diseases and malignancy, carrier detection; prenatal and postnatal screening; Assisted reproductive techniques and Pre-implantation diagnosis and Genetic Counseling

Unit: 4 **9 Lectures**

Therapies for genetic disorders and Multifactorial diseases: Stem Cell Therapies: Stem cell types, cord blood cells, bone marrow transplantation, current stem cell therapies, Gene Therapies, Problems in gene therapy, Chemo and Radio therapies; Techniques in tissue engineering: tissue grafting, synthetic blood, skin grafts and metallic implants.

Suggested reading:

1. Brown, S.M., (2009). *Essentials of Medical Genomics*. Wiley-Blackwell.
2. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009). *Lewin's Gene X*. Jones & Barlett.
3. Krebs, J.E., Goldstein, E.S. and Kilpatrick, S.T. (2014). *Lewin's Genes XI*. Jones and Bartlet India Pvt. Ltd.

4. Lodish, H., Berk, A., Chris, A. K., Krieger, M. (2008), *Molecular Cell Biology*. W.H. Freeman, USA.
5. Milunsky A, Milunsky J (2009). *Genetic Disorders and the Fetus: Diagnosis, Prevention and Treatment*, 6th Edition. Wiley-Blackwell publishers.

LML.604: Evolution and Developmental Genetics **Credit hours:4**

Course Objective: This course is an introduction to animal evolution and development. The principal objective is to introduce students to the origin of life and developmental processes that lead to the establishment of the body plan of vertebrates and the corresponding cellular and genetic mechanisms. This will allow students, at a later stage, to understand organogenesis and histogenesis, as well as pathology related to mechanisms of development and differentiation.

Unit: 1 **16 Lectures**

Emergence of evolutionary thoughts & Origin of life: Lamarckism, Darwinism, Concepts of variation, adaptation, struggle, Mendelism, Spontaneity of mutations, Theories of phyletic gradualism vs. punctuated equilibria, Modern evolutionary synthesis. Origin of basic biological molecules, Abiotic synthesis of organic monomers and polymers, Concept of Oparin and Haldane, Experiment of Miller (1953), The first cell, Evolution of prokaryotes, Origin of eukaryotic cells, Evolution of unicellular eukaryotes, Anaerobic metabolism, Photosynthesis and aerobic metabolism.

Unit: 2 **14 Lectures**

Paleontology and molecular evolution: The evolutionary time scale, Eras, periods and epoch, Major events in the evolutionary time scale, Origins of unicellular and multicellular organisms, Stages in primate evolution including *Homo sapiens*. Concepts of neutral evolution, Molecular divergence and molecular clocks, Molecular tools in phylogeny, Classification and identification; Origin of new genes and proteins; Gene duplication and divergence.

Unit: 3 **14 Lectures**

Basic concepts of development: Totipotency, Commitment, Specification, Induction, Competence, Determination and Differentiation, Morphogenetic gradients, Cell fate and cell lineages, Stem cells, Genomic equivalence and the cytoplasmic determinants, Imprinting, Mutants and transgenics in analysis of development.

Unit: 4 **10 Lectures**

Gametogenesis, fertilization and cell death: Production of gametes, Cell surface molecules in sperm-egg recognition in animals; Embryo-sac development and double fertilization in plants, Zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals, Embryogenesis and establishment of symmetry in plants, Seed formation.Hypersensitive response, functions, relevance with diseases, apoptosis, Caspases, Importance of PCD in plant development, role of PCD, model of PCD.

Suggested Reading:

1. Darwin, C.R. (1911). *On the origin of species by means of natural Selection, or preservation of favoured races in the struggle for life*. Hurst Publishers, UK.

2. Dawkins, R. (1996). *The Blind Watchmaker*, W.W. Norton & Company Jones and Bartlett Publishers.
3. Futuyma, D.J. (2009). *Evolution*. Sinauer Associates Inc. USA.
4. Hake, S. and Wilt, F. (2003). *Principles of Developmental Biology*. W.W. Norton & Company, New York, USA.
5. Hall, B.K. and Hallgrimsson, B. (2007). *Strickberger's Evolution*.Jones and Bartlett Publishers, India.
6. Lewin, R. (2004). *Human Evolution - An Illustrated Introduction*. Wiley-Blackwell, USA.
7. Scott, F. and Gilbert, S.F. (2010). *Developmental Biology*. Sinauer Associates, Inc. USA.
8. Slack, J.M.W. (2005). *Essential Developmental Biology*, Wiley-Blackwell, USA.

LML.605: Radiation Biology **Credit Hours:4**

Course Objectives: From this course the students would have fair knowledge of basic concepts of radiation biology such as radiation physics, radiation biology and radiological protection. the students will also learn the applications of radiations and radio diagnosis/therapeutics.

Unit: 1 **20 Lectures**

Basics of Radiation Biology: Types of radiation, characteristics and biological effects of ionizing radiations, types of radiation emitters and their interaction with matter, linear energy transfer and relative biologic effectiveness.

Radioisotopes and stable isotopes. Radiation protection, maximum permissible dose (MPD).Radiation dosimetry, personnel monitoring, use of various radiation survey meters, film badges and room contamination monitors. Radiation hazard evaluation and control: control of external and internal exposure. Natural and man-made radiation exposures, major radiation accidents and environmental radiation exposure.

Radiation Safety and Regulation: Storage and handling of radioactive sources, safe work practice and decontamination. Radiation protection measures in industrial establishment, radioisotope labs, diagnostic/therapeutic installation and during transportation of radioactive substances, disposal of radioactive waste, administrative & legislative aspect of radiation protection

Unit: 2 **18 Lectures**

The oxygen Effect: Chemistry and biology of reactive oxygen species (ROS), oxidative stress and free radicals their role in cell metabolism, effects on marco/micromocules (proteins, lipids and DNA) and diseases (diabetes, neurodegenerative diseases, inflammation and cardiovascular disorders). Antioxidant defence system.

Radiation and Cell Signalling: Extracellular mediators and enzymes involved in radiation-induced bystander effects (RIBE) and their role in signalling, intracellular pathways and apoptotic and cell cycle regulatory factors (p53, p21, p34, and MDM2). Correlation between membrane integrated channels and mitochondrial functions with radiation-induced bystander effects. Radiation immunology: immunity response, radiation as immunosuppressive agent

Unit: 3 **18 Lectures**

Acute Radiation Effects: Concept of LD_{50}, central nervous system syndrome, gastro-intestinal syndrome, bone marrow syndrome and skin reactions. **Chronic effects of radiations:** Early and delayed effects of radiation exposure, cataractogenesis and carcinogenesis.Hereditary effects of radiation: chromosomal and chromatid aberrations, mutations in growth promoting proteins, mutations causing loss of growth-inhibition and cell cycle control.

Unit: 4 **16 Lectures**

Diagnostic radiology: Sources of radiation, doses and their risk in diagnostic radiology. Interventional radiology and nuclear medicine. Molecular techniques in radiobiology and gene therapy. Radiations in tumour therapy: theoretical basis for radiation and chemotherapy interactions. Experimental chemotherapy and drug resistance. Radio-sensitizers, radio-protectors and bio-reductive drugs.

Suggested Reading

1. Bushong, S. C. (2008).*Radiologic Science for Technologists: Physics, Biology, and Protection,*Mosby Publishers, Inc, USA.
2. Forshier, S. (2008) *Essentials of Radiation, Biology and Protection*, Cengage Learning, USA.Cengage.
3. Hall, E. J. and Giaccia, A. (2011). *Radiobiology for the Radiologist*, Lippincott Williams & Wilkins, USA.
4. Halliwell, B. and Gutteridge, J. M. C. (2007)*Free Radicals in Biology and Medicine*, Oxford University Press, USA.
5. Knoll, *G. F. (2010) Radiation Detection and Measurement*, Wiley, John & Sons, USA.
6. Martin, A., Harbison, S., Beach, K. and Cole, C. (2012) *An Introduction to Radiation Protection,*Hodder Arnold Publishers, UK.
7. Sitaramaya, A. (2010). Signal Transduction: Pathways, Mechanisms and Diseases. Springer

HGL.605 Aging, Longevity and Health **Credit Hours:4**

Course Objectives: Aging is a conserved biological process and it is also the critical risk factor for a variety of human pathologies. This course helps students to understand the causal underlying cellular and molecular processes that deteriorate with age and lead to increased disease susceptibility.

Unit 1 **9 Lectures**

Basic Concept &Theories of Aging: Overview and symptoms of aging, model organisms, Theories of aging- Genetic (Genetic control, Hayflick limit, DNA damage, error and repair, accumulated mutation, gene mutation, telomerase, antagonistic pleiotropy and redundant DNA theories), Non-genetic (Wear and tear, waste accumulation, cross-linkage, free-radical, order to disorder and disposable soma) and Physiological theories (Immunological, neuroendocrine, death hormone (DECO), thymic-stimulating, rate of living and calorie restriction theories).

Unit:2 **18 Lectures**

Factors influencing Aging: DNA damage and repair, cellular senescence and apoptosis, sirtuins and deacetylases, hormones, glycation, protein damage, attenuated immunity, inflammation, accumulation of toxins and garbage in aging,

Unit: 3 **18 Lectures**

Molecular Mechanism of Aging: Mechanisms affecting aging due to calorie restriction, insulin signalling, mitochondria and telomerase. Longevity genes and biomarkers of aging, Cancer and aging.

Unit: 4 **9 Lectures**

Age associated diseases and Healthy Aging: Atherosclerosis and cardiovascular disease, cancer, arthritis, cataracts, osteoporosis, type 2 diabetes, hypertension and Alzheimer's disease. Concept of healthy aging.

Suggested readings:

1. *Edward J. Masoro and Steven N. Austad* (2011). Handbook of the biology of aging. 7th Edition. Academic Press, USA.
2. Jan Vijg (2007). Aging of the Genome: The Dual Role of DNA in Life and Death. 1st Edition. Oxford University Press, UK.
3. Surish Rattan (2003). Modulating Aging and Longevity (Biology of Aging and its Modulation). Springer, USA.
4. Thomas von Zglinicki (2003). Aging at the Molecular Level. Springer Science & Business Media, USA.
5. A Macieira-Coelho (2003). Biology of aging. I[st] edition. Springer Verlag Berlin Heidelberg, New York.

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SEMESTER – IV

S.No	Paper Code	Course Title	L	T	P	Cr
1	HGL.621	Structural Biology and Pharmacogenomics	4	-	-	4
2	HGL.622	Advances in Nutrigenomics	4	-	-	4
3	HGD.600	Dissertation	-	-	16	16
			8	0	16	24

L: Lectures, T: Tutorial, P: Practical Cr: Credit.

HGL. 621: Structural Biology and Pharmacogenomics Credit hours :4

Unit: 1 18 Lectures

Structure of Biomolecules: Introduction to different types of biochemical bonds and interactions, Different structural confirmations of DNA, RNA and Proteins, Primary and secondary structure of nucleic acids, secondary, tertiary and quaternary structure of Proteins.

Unit: 2 18 Lectures

Structure analysis of biomolecules: Prediction analysis method and tools for three dimensional structures, thermodynamics and kinetics of conformational transition, protein folding, tools and techniques for studying macromolecular interaction.

Unit: 3 18 Lectures

Experimental analysis of biomolecules: Experimental methods for purification of DNA, RNA and Proteins, Ultra centrifugation, sedimentation velocity and equilibrium-determination of molecular weights, Methods used for determination of protein structure, introduction to structural databases for protein studies.

Unit: 4 18 Lectures

Pharmacogenomics: Introduction with example of Warfarin, anti-psychotic, anti-epileptic and anti-cancer drugs like Methotrexate and Tamoxifen, Trends in pharmacogenomics studies, Functional genomics in new drug discovery, Genome-guided identification and validation of drug targets, personalized medicine.

Suggested readings:

1. Brandon, C. and Tooze, J. (1999) Introduction to Protein Structure. Garland Publishers, London.

2. Hartl, D.L. and Jones, E.W. (2005). Genetics: Analysis of Genes and Genomes Jones and Barlett Publishers, Massachusetts. 3. Jain, K.K. (2001). Drug Discovery: Current Trends and Future Prospects. Urch Publishers, London.

4. Leach, A.R. (2001). Molecular Modelling. Principles and Applications. Addison Wesley Longman, Essex.

5. Nelson, D.L. and Cox, M.M. (2008). Lehninger's Principles of Biochemistry. W.H. Freeman and Co., New York.

6. Altman RB, Flockhart D and Goldstein DB (2012). Principles of Pharmacogenetics and Pharmacogenomics. Cambridge University Press.

HGL. 622: Advances in Nutrigenomics Credit hours :4

Unit: 1 18 Lectures

Nutritional Biochemistry: Essential and non-essential nutrients, measurement of calorie values of foods, recommended dietary allowances, basal metabolic rate (BMR), malnutrition, malabsorption and interventional strategies.

Unit: 2 18 lectures

Nutrigenomics vs Nutrigenetics: Diet and gene expression: nutrients as regulators of activity and transcription factors. Diet in early life and metabolic programming. Diet as a possible risk or

preventive factor in illnesses. Gene polymorphisms and responses to diet. Examples related to cardiovascular disease, cancer, osteoporosis.

Unit: 3 **18 Lectures**

Biomarkers and recent advances in Nutrigenomics: Risk/benefit biomarkers, Genetic and nutritional control of Lipid Metabolism, Metabolomics and personalized nutrition.

Unit: 4 **18 Lectures**

Metabolism and Epigenetics: Metabolic Regulation of DNA Methylation in Mammals, Dietary and Metabolic compounds affecting chromatin dynamics/remodeling, Effect of Diet on Epigenetic processes.

Suggested readings:

1. Ferguson, L,R.(2013) *Nutrigenomics and Nutrigenetics in Functional Foods and Personalized Nutrition*. CRC Press.
2. Tollefsbol T (2011). *The New Molecular and Medical Genetics*. Elsevier Inc
3. Simopoulos A.P. and Ordovas J.M. (2004). Nutrigenetics and Nutrigenomics Karger Publishers
4. Rimbach, G and Fuchs, J (2005) *Nutrigenomics (Oxidative Stress and Disease)*. CRC press

HGS 600: Dissertation **Credit Hours: 16**

Centre for Human Genetics and Molecular Medicine

Scheme of Programme Ph.D. Life Sciences with specialization Human Genetics

S.No	Paper Code	Course Title	L	T	P	Cr
1	**LSL.701**	Research Methodology and Biostatistics	5	-	-	5
2	**LSL.702**	Bioethics, Biosafety and Good Laboratory Practices	4	-	-	4
3	**HGL.703**	Advanced Human Cytogenetics and Molecular Genetics	5	-	-	5
4	**HGL.704**	Advanced Human Genomics and Epigenetics	5	-	-	5
5	**HGS.700**	Seminar	1	-	-	1
		Total Credit Sem-1	20	0	0	20

L: Lectures, T: Tutorial, P: Practical, Cr: Credit

LSL.701: Research Methodology and Biostatistics Credit Hours:5

Course Objective: To teach students the basics of research, scientific writing, literature search and paper writing.

Unit 1 **20 Hours**

General principles of research: Meaning and importance of research, Critical thinking, Formulating hypothesis and development of research plan, Review of literature, Interpretation of results and discussion.

Technical writing: Scientific writing, Writing synopsis, Research paper, Poster preparation and Presentations and Dissertation; IPR and related issues.

Unit 2 **20 Hours**

General Statistics: Difference between parametric and non-parametric statistics, Univariant and multivariant analysis, Confidence interval, Errors, Levels of significance, Hypothesis testing.

Measures of central tendency and dispersal, Histograms, Probability distributions (Binomial, Poisson and Normal), Sampling distribution, Kurtosis and skewness

Unit 3 **25 Hours**

Comparative Statistics: Comparing means of two or more groups: Student's t-test, Paired t-test, Mann-Whitney U-test, Wilcoxon signed-rank, One-way and two-way analysis of variance (ANOVA), Critical difference (CD), Fisher's LSD (Least significant difference), Kruskal–Wallis one-way ANOVA by ranks, Friedman two-way ANOVA by ranks, Chi-square test

Regression and correlation: Standard errors of regression coefficients, Comparing two regression lines, Pearson Product - Moment Correlation Coefficient, Spearman Rank correlation coefficient, Power and sampling size in correlation and regression.

Unit 4 **25 Hours**

Fundamentals of computer: Parts of computer, Hardware, BIOS, Operating systems, Binary system, Logic gates and Boolean Algebra. Application software: Spreadsheet applications, Word-processing applications, Presentation applications, Internet browsers, Reference Management, and Image processing applications. Computer language: Basic DOS commands, Auto HotKey scripting language, HTML and basic structure of a webpage, Designing websites. World wide web: Origin and concepts, Latency and bandwidth, Searching the internet, Advanced web-search using Boolean logic, Cloud computing.

Suggested Readings:

1. Gupta, S. (2008). *Research methodology and Statistical Techniques*. Deep & Deep Publications (P) Limited, New Delhi.

2. Kothari, C. R. (2014). *Research Methodology (s)*. New Age International (p) Limited. New Delhi.

3. Sahay, Vinaya and Pradumna Singh (2009). *Encyclopedia of Research Methodology in Life Sciences*. Anmol Publications. New Delhi

4. Kauda J. (2012). *Research Methodology: A Project Guide for University Students*. Samfunds Litteratur Publications

5. Dharmapalan B. (2012). Scientific Research Methodology. Narosa Publishing House ISBN: 978-81-8487-180-7.

6. Norman, G. and Streiner, D. (2008). *Biostatistics: The Bare Essentials*.3/e (with SPSS). Decker Inc. USA.
7. Rao, P. P., S. Sundar and Richard, J. (2009). *Introduction to Biostatistics and Research Methods*. PHI learning.
8. Christensen, L. (2007). *Experimental Methodology*. Boston: Allyn & Bacon.
9.Clive Opie (2004). *Doing Educational Research- A Guide for First time Researchers*. New Delhi: Vistar Publications.
10. Fraenkel, J.R., Wallen, N.E. (2009). How to Design and Evaluate Research in Education. 7th edition, New York: McGraw Hill.
11. Kumar Ranjit (2011). *Research Methodology: A Step-by-Step Guide for Beginners Field*. Sage Publications.

LSL.702: Bioethics, Biosafety and Good Laboratory Practices **Credit Hours:4**

Unit 1 **20 Hours**

Introduction and Principals of Good Lab Practice: Good laboratory practices, Biosafety for human health and environment. Biosafety issues for using cloned genes in medicine, agriculture, industry, and ecoprotection. Biological warfare, Biological containment and physical containment, CDC Biosafety levels, Biosafety in Clinical laboratories and biohazard management.

Unit 2 **20 Hours**

Bioethics and Biosafety in Molecular Biology: Gene pollution, Biological invasion, Risk and safety assessment from genetically engineered organisms, special procedures for r-DNA based products.

Unit 3 **25 Hours**

Research ethics: Ethical theories, Ethical considerations during research, data manipulations, subject consent, Animal testing. Animal rights, Perspectives and methodology, Ethical issues of the human genome project,

Unit 4 **25 Hours**

Medical and Clinical Ethics: Code of **Ethics** in **Medical/clinical laboratories,** healthcare rationing, ethical issues of xenotransplantation, Ethics involved in embryonic and adult stem cell research, Ethics in Assisted Reproductive Technologies: animal and human cloning and *In-vitro* fertilization, the element of Informed Consent, Ethical issues in MTP and Euthanasia.

Suggested reading:

1. Fleming, D. O. and Hunt, D.L. (2006). *Biological Safety: Principles and Practices*. American Society for Microbiology, USA.
2. Rockman, H. B. (2004). *Intellectual Property Law for Engineers and Scientists*. Wiley-IEEE Press, USA.
3. Shannon, T. A. (2009). *An Introduction to Bioethics*. Paulist Press, USA.
4. Vaughn, L. (2009). *Bioethics: Principles, Issues, and Cases*. Oxford University Press, UK.
5. WHO (2005). *Laboratory Biosafety Manual*. World Health Organization.

Related Weblinks:

1. http://www.absa.org/resbslinks.html

2. http://bch.cbd.int/protocol/
3. http://global.oup.com/uk/orc/law/ip/macqueen2e/resources/weblinks/
4. http://www.icgeb.org/~bsafesrv/

HGL.703: Advanced Human Cytogenetics and Molecular Genetics **Credit Hours: 5**

Course Objectives: With the advances in cytogenetic technology, information regarding human genomics, disease and cancer genetics, chromosome evolution and the relationship of nuclear structure to function have grown in spurts. Human Molecular Genetics is a vast field that provides understanding of the structure and function of the normal human genome. Human molecular genetics not only forms the cutting edge of biomedical research, but at the same time it has immediate application to the diagnosis of disease and has great potential for treating disease. Thus it is of major interest to all students of biological science and medicine, and to a wide range of biomedical researchers.

Unit 1 **18 lectures**

Advanced Human Cytogenetics: GTG banding and Nomenclature of human chromosomes; Structure of X and Y chromosome; X and Y Pairing and Pseudoautosomal region; Molecular mechanism of X inactivation Molecular Cytogenetics methods-FISH, CGH, SKY, Cytogenetics of Cancer.

Unit 2 **18 lectures**

Tissue culture techniques: Whole Blood Culture, Bone Marrow Culture, Amniocyte Culture, Chorionic villi culture, Skin Fibroblast culture.

Unit 3 **18 lectures**

DNA structure and Gene Regulation: DNA structure and superstructure, DNA replication initiation and termination, Chromosomal compaction and mechanism of gene regulation, Mechanism of mutation and DNA repair.

Unit 4 **18 lectures**

Techniques in Molecular Genetics: Isolation and purification of RNA , DNA (genomic and plasmid) and proteins, Analysis of RNA, DNA and proteins by one and two dimensional gel electrophoresis, Isolation of specific nucleic acid sequences, In vitro mutagenesis and deletion techniques, gene knock out in bacterial and eukaryotic organisms, DNA sequencing methods, strategies for genome sequencing, .RFLP, RAPD and AFLP techniques

Suggested reading:

1. Griffiths, A.J.F., Wessler, S.R. and Carroll, S.B. (2012). *An Introduction to Genetic Analysis*. W.H. Freeman Publication, New York.
2. Gillham, N. W.(2011). *Genes, Chromosomes and Disease.: From Simple Traits, to Complex Traits, to Personalized Medicine*. Pearson.
3. Hein, S. and Mitelman, F. (2009). *Cancer Cytogenetics*. Wiley-Blackwell.
4. Klug, W.S., Cummings, M.R., Spencer, C.A. and Palladino, M.A. (2012). Concepts of Genetics. Pearson.
5. F Vogel A.G. Motulusky. Human Genetics: Problems and Approaches. Second Completely Revised Edition, Springer-Verlag. (latest edition)

6. Golder N. Wilson, M.D., Ph.D. Clinical Genetics-A Short Course. A John Wiley and Sons, Inc., Publication. (latest edition)

HGL.704: Advanced Human Genomics and Epigenetics **Credit Hours:5**

Course Objectives: The aim of the course is to make students understand the advanced concepts of genetics and basic principles of epigenetics.

Unit 1 **18 lectures**

Recombinant DNA Technology: Molecular cloning of DNA or RNA fragments in bacterial and eukaryotic systems; Expression of recombinant proteins using bacterial, animal and plant vectors; Isolation of specific nucleic acid sequences, Generation of genomic and cDNA libraries in plasmid, phage, cosmid, BAC and YAC vectors; protein sequencing methods, Detection of post translation modification of proteins; Methods for analysis of gene expression at RNA and protein level.

Unit 2 **18 lectures**

Pharmacogenomics and Overview of Human Genome Project: Concept of individual based treatment, Drug Metabolism; Genetic makeup and Drug Response; High throughput screening for drug discovery; Identification of drug targets; Pharmacogenetics and drug development, Personalized Medicine; goals of Human Genome Project, its implications on research and human society; Strategies for genome sequencing; Early, next and third generation DNA sequencing methods; Personalized medicine.

Unit 3 **18 lectures**

Introduction and molecular mechanisms of Epigenetics: Mechanisms of DNA methylation; Histone modifications; Chromosomal position effect and gene variegation; Epigenetic control of gene activity; Analysis of gene-specific DNA methylation; Methods of assessing genome-wide DNA methylation, Model organism of epigenetic: Drosophila

Unit 4 **18 lectures**

Epigenetic Epidemiology: Effects of diet and environmental agents on epigenetic processes; Impact of microbial infections on the human epigenome; Cancer epigenetic, Role of epigenetic in immune disorders; imprinting disorders in humans.

Suggested reading:

1. Tollefsbol T.(2011). *Handbook of Epigenetics*, Elsevier Publications
2. Carey N. (2013). *The Epigenetics Revolution: How Modern Biology Is Rewriting Our Understanding of Genetics, Disease, and Inheritance.* Columbia Univ Pr.
3. Wallach J (2014). *Epigenetics: The Death of the Genetic Theory of Disease Transmission. Kindle Publications,* Columbia University Press.
4. Francis R.C. (2012). *Epigenetics: How Environment Shapes Our Genes.* W.W. Norton and Company, New York.
5. Jocelyn, E. K., Elliot, S. G. and Stephen, T. K. (2009), *Lewin's Gene X.* Jones & Barlett.
6. Korf, B.R. (2006). *Human Genetics and Genomics.* Wiley Blackwell.

7. Lodish, H., Berk, A., Chris, A. K., Krieger, M. (2008), *Molecular Cell Biology*. W.H. Freeman, USA.

HGS.700 Seminar **Credit Hours: 1**

Central University of Punjab, Bathinda

Centre For Human Genetics and Molecular Medicine

M.Sc. Life Sciences Specialization in Molecular Medicine

Credit Structure of M.Sc. Life Sciences with specialization in Molecular Medicine

Course type	Required as per CBCS system, UGC	Percent and Actual Credit in M.Sc. Mol. Med
Foundation	10-15% i.e.7.2 to 10.8	12% (8)
Elective and IDs	25-35% i.e.18 to 25.2	32% (22)
Core	50-65% i.e. 36 to 46.7	56% (38)
Total credits (excluding dissertation)		**68**

(File : 2)

M.Sc. Life Sciences Specialization in Molecular Medicine

	Semester-I						
S.No	Course Code	Course Title	Course Type	L	T	P	Cr
1	LSL.501	Research Methodology	F	2			2
2	LSL.502	Introduction to Biostatistics	F	2	-	-	2
3	LSL.504	Introduction to Cell and Molecular Biology	C	3	-	-	3
4	LSL.506	Basic and Clinical Biochemistry	C	3	-	-	3
5	LSL.508	Concepts of Genetics	C	3			3
6	LML.510	Concepts and Prospects in Molecular Medicine	E	4	-	-	4
7	*	Inter-Disciplinary Elective -1 (From Other Departments)		2	-	-	2
8	LSP.503	Introduction to Biostatistics	F	-	-	2	1
9	LSP.505	Introduction to Cell and Molecular Biology	C	-	-	2	1
10	LSP.507	Basic and Clinical Biochemistry	C	-	-	2	1
11	LSP.509	Concepts of Genetics	C	-	-	2	1
12	LMS.599	Credit Seminar	C			2	1
		Total		19	0	10	24

L: Lecture T: Tutorial P: Practical S: Seminar Cr: Credit
F: Foundation Course, C: Core Course, E: Elective course, ID: Inter-disciplinary course

ID courses offered by Molecular Medicinefaculty in Semester-I

S.No.	Course Code	Course title (offered by)	Credits
1	LML.511	Basics of Stem Cell Biology (Dr. Sandeep Singh)	2
2	LML.512	Introduction to Immune System (Dr. Monisha Dhiman)	2
3	LML.513	Introduction to Human Cancers (Dr. Harish Chander)	2

LSL.501: Research Methodology. **Credit Hours: 2.**

Learning Objective: To ensure that the students of molecular medicine understands various aspects of research related methods, technical/scientific writings and literature search.

Unit: 1 **5 Lectures**

General principles of research: Meaning and importance of research, critical thinking, formulating hypothesis and development of research plan, review of literature, interpretation of results and discussion, Plagiarism.

Unit: 2 **10 Lectures**

Technical writing: Scientific writing that includes the way of writing Synopsis, research paper, poster preparation and presentation, and dissertation.

Unit: 3 **5 Lectures**

Library: Classification systems, e-Library, web-based literature search engines

Unit: 4 **16 Lectures**

Entrepreneurship and business development: Importance of entrepreneurship and its relevance in career growth, characteristics of entrepreneurs, developing entrepreneurial competencies, types of enterprises and ownership (large, medium SSI, tiny and cottage industries, limited, public limited, private limited, partnership, sole proprietorship) employment, self-employment and entrepreneurship, financial management-importance and techniques, financial statements- importance and its interpretation, and Intellectual Property Rights (IPRs).

Suggested Reading:

1. Gupta, S. (2005). *Research methodology and statistical techniques.* Deep & Deep Publications (p) Ltd.
2. New Delhi.Kothari, C.R. (2008). *Research methodology (s). New Age International* (p) Limited. New Delhi.
3. Sahay, Vinaya and Pradumna Singh (2009). *Encyclopedia of Research Methodology in lifesciences.* Anmol Publications. New delhi
4. Kauda J. (2012). *Research Methodology: A Project Guide for University Students.* Samfundsliteratur Publications.
5. Dharmapalan B. (2012). *Scientific Research Methodology.* Narosa Publishing House ISBN: 978-81-8487-180-7.
6. Norman, G. and Streiner, D. (2008). Biostatistics: The Bare Essentials.3/e (with SPSS). Decker Inc. USA.
7. Rao, P. P., S. Sundar and Richard, J. (2009). *Introduction to Biostatistics and Research Methods.* PHI learning.
8. Christensen, L. (2007). *Experimental Methodology.* Boston: Allyn and Bacon.
9. Clive Opie (2004). *Doing Educational Research- A Guide for First time Researchers. New Delhi:* Vistar Publications. Fraenkel.
10. J.R, Wallen, N.E. (2009). *How to Design and Evaluate Research in Education.* 7th edition, New York: McGraw Hill.
11. Kumar Ranjit (2011). *Research Methodology: A Step-by-Step Guide for Beginners* Field. Sage Publications.

LSL.502: Introduction to Biostatistics. **Credits Hours: 2.**

Course Objectives: This course will give a basic but significant exposure towards better understanding of biostatistics and application. Applications of biostatistical approaches are pivotal in testing hypothesis, designing experiments, analyzing experimental data and interpreting the results of biological research.

Unit: 1 **6 Lectures**

Overview of Biostatistics: Difference between parametric and non-parametric statistics, Univariant and multivariant analysis, Frequency distribution, Measures of central tendency and variation, Graphical representation of data, Levels of significance, Hypothesis testing.

Unit: 2 8 Lectures

Descriptive Statistics: Probability and probability distributions (Binomial, Poisson and Normal), Kurtosis and Skewness, Correlation and regression.

Unit: 3 8 Lectures

Experimental Design and Analysis: Sampling techniques, Sampling theory, various steps in sampling, Sampling distribution.

Unit: 4 14 Lectures

Inferential Statistics: Chi-Square test, Student's t-test, F-Test, Z-Test, Mann-Whitney U-test, Wilcoxon signed-rank, One-way and two-way analysis of variance (ANOVA).

Suggested Readings:

1. Norman, G. and Streiner, D. (2008). *Biostatistics: The Bare Essentials.* (SPSS), 3rd Edition, Decker Inc. USA.
2. Sneath, P.H.A. and Sokal, R.R. (1973). *Numerical Taxonomy.* Freeman, San Francisco.
3. Sokal, R.R. and Rohlf, F.J. (1994). *Biometry: The Principles and Practices of Statistics in Biological Research.* W.H. Freeman publishers, USA.
4. Banerjee P.K (2014). *Introduction to Biostatistics.* S.Chand, India
5. Daniel WW (2010). *Biostatistics: A Foundation for Analysis in the Health Sciences.* John Wiley and Sons Inc.
6. Bailet NTJ. *Statistical Methods in Biology.* Cambridge Univ. Press.
7. Glaser AN. *High-Yield Biostatistics.* Lippincott Williams & Wilkins.

LSL.504: Introduction to Cellular and Molecular Biology — Credit Hours: 3.

Learning Objective: Students will understand the structures and purposes of basic components of membranes, and organelles and their related functions. Understanding the molecular processes of DNA replication, transcription, and translation, and how they are managed in cells. Understand the basic mechanisms of cellular signal transduction and regulation of gene expression.

Unit: 1 15 Lectures

Introduction to the Cell: prokaryotic and eukaryotic cells, Single cell to multicellular organisms.

Membrane Structure and Function: Models of membrane structure, membranes of intracellular organelles;Membrane transport.

Protein Secretion and Sorting: Structure and functions of intracellular organelles, Intracellular traffic and secretory pathways, protein sorting, endocytosis and, exocytosis.

Unit: 2 12 Lectures

The Cytoskeleton:cell cytoskeleton and its organization including extracellular matrix, adhesions and junctions.

Cell-cell communication and cell growth: Overview of cell signaling, cell surface receptors and second messengers, cell cycle and its regulation.

Unit: 3 15 Lectures

Chemical structure and functions ofNucleic acids: Chemical structure of DNA and RNA Watson-Crick model, Different forms of DNA and RNA, Organelle DNA, Regulation of nucleosome assembly chromatin.

Gene and Genome organization: Split genes, Overlapping genes, Transposons & retrotransposons, Gene clusters, Mechanism of DNA replication, DNA damage and their repair.

Unit: 4 **12 Lectures**

Transcription and mRNA Processing: transcription and transcription factors, Transcriptional and post-transcriptional gene silencing, mRNA processing: Capping, Polyadenylation, Splicing, editing, mRNA stability.
Translation: Genetic code, the translation machinery, mechanisms of chain initiation, elongation and termination, regulation of translation, post-translational modifications of proteins.

Suggested Reading:

1. Alberts, B., Bray, D., Lewis, J., Raff, M., Roberts, K. and Watson, J.D. (2010). *Molecular Biology of the cell*. Garland publishers, Oxford.
2. Celis, J.E. (2006). *Cell biology: A laboratory handbook*, Vol 1, 2, 3. Academic Press, UK.
3. Gupta, P.K. (2008). *Cytology, Genetics and Evolution*. Rastogi publications, Meerut, India
4. Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. John Wiley & Sons. Inc. New Delhi, India.
5. Robertis, (2011). *Cell and Molecular Biology*. Lippincott Williams & Wilkins
6. Fasman, G.D. (1989). *Practical Handbook of Biochemistry and Molecular Biology*. CRC Press, Taylor and Francis Group, UK.
7. James, D.W., Baker,T.A., Bell, S.P., Gann, A. (2009). *Molecular Biology of the Gene*. Benjamin Cummings, USA.
8. Jocelyn, E.K., Elliott, S.G., Stephen, T.K. (2009). *Lewin's Genes X*. Jones & Bartlett Publishers, USA.
9. Johnson, A., Lewis, J., Raff, M. (2007). *Molecular Biology of the Cell*. Garland Science, USA.
10. Lodish, H.,Berk, A., Chris, A.K. and Krieger, M. (2011). *Molecular Cell Biology*. W.H. Freeman, USA.
11. Sambrook, J., Fritish, E.F., Maniatis, T. (2012). *Molecular cioning: A laboratory manual*. Cold Spring Harbor Laboratory Press, New York.

LSL506: Basic and ClinicalBiochemistry. **Credits Hours: 3.**

Course Objectives: The course aims to provide an advanced understanding of the core principles and topics of Biochemistry and their experimental basis.

Unit: 1 **15 Lectures**

Essentials of Clinical Biochemistry: Molecular structure and physical properties of water, Ionization of water, weak acids and weak bases, pH and buffers. Interpretation of biochemical tests, Clinical hematology, chemical composition of blood, urine and cerebrospinal fluids, water and sodium balance, Acid-base balance disorders, Potassium, calcium, magnesium and phosphate metabolism and associated diseases. Vitamins and trace elements disorders and metal poisoning.

Unit: 2 **14 Lectures**

Biomolecules and Metabolic Disorders: Structure and functions of carbohydrates, lipids, amino acids, proteins, nucleic acids and vitamins. Bioenergetics and thermodynamics, Phosphoryl group transfer and ATP, Biological oxidation-reduction reactions, Glycolysis, citric acid cycle and oxidative phosphorylation. Liver function test, jaundice, diabetes mellitus, hypoglycemia, hypertension, hypo- and hyper-thyroidism.

Unit: 3 **10 Lectures**

Conformation of Biomolecules: Ramachandran plot, Secondary, Tertiary and Quaternary structure, Domains, Motif and Folds. Protein denaturation and folding, Oxygen binding proteins, Hill equation, Bohr Effect, Nucleic acids: A-, B-, Z-DNA forms, tRNA, micro-RNA, Stability of protein and Nucleic acid structures.

Unit: 4 **15 Lectures**

Enzymology: Classification, Principles of catalysis, Mechanism of enzyme catalysis, Enzyme kinetics, Enzyme inhibition, Enzyme regulation, Isozymes and Clinical enzymology.

Suggested Reading:

1. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2010). *Biochemistry.* W.H. Freeman & Company. USA.
2. Brown, T.A. (2006). *Gene Cloning and DNA analysis: In Introduction.* Blackwell Publishing Professional. USA.
3. Haynie, D.T. (2007). *Biological thermodynamics.* Cambridge University. UK.
4. Mathews, C.K., Van Holde, K.E. and Ahern, K.G. (2000). *Biochemistry.* Oxford University Press Inc. New York.
5. Nelson, D. and Cox, M.M. (2008). *Lehninger Principles of Biochemistry.* BI publications Pvt. Ltd. Chennai, India.
6. Ochiai, E. (2008). *Bioinorganic Chemistry: A survey.* Academic Press. Elsevier, India.
7. Randall, D. J., Burggren, W. and French, K. (2001). *Eckert Animal Physiology.* W.H. Freeman & Company. USA.
8. Raven, P.H., Johnson, G.B. and Mason, K.A. (2007) *Biology.* Mcgraw-Hill. USA.
9. Shukla AN (2009). *Elements of Enzymology.* Discovery Publishing. New Delhi, India.
10. Voet, D. and Voet, J.G. (2008). *Principles of Biochemistry.* CBS Publishers &Distributors. New Delhi, India.
11. R Swaminathann. (2011). *Handbook of Clinical Biochemistry.* 2 edition, World Scientific Publishing Company, New Jersey, USA
12. Martin A Crook (2012). *Clinical Biochemistry and Metabolic Medicine.* CRC press, Taylor & Francis Group, USA

LSL.508: Concepts of Genetics. Credits Hours: 3.

Learning Objective: Students will learn the basic principles of inheritance at the molecular, cellular and organism level. This course will make them understand the causal relationships between molecule/cell level phenomena ("modern" genetics) and organism-level patterns of heredity ("classical"genetics).

Unit: 1 10 Lectures

Basics of Inheritance: Mendel's Lawsof inheritance, Concept of segregation, independentassortment and dominance, Chromosome theory of inheritance, Alleles and multiple alleles, Locus concept, Epistasis, Crossing over and recombination, Pedigree analysis, Linkage analysis and gene mapping: Coupling and repulsion phase linkage, Application of Mendel's laws to populations, Hardy-Weinberg principle, inheritance of quantitative traits.

Unit: 2 17 Lectures

Chromosomal Mutations and Gene Concept: Type of chromosomal aberrations: deletions,duplications, inversions, translocations, Change in chromosome number: trisomy and polyploidy. Evolutionary history of bread wheat, Aneuploids–nullisomics, monosomics, and trisomics, Somatic aneuploids, Changes in chromosome structure, Properties of chromosomes for detection of structural changes. Mutations: Spontaneous and induced mutations, Somatic vs germinal mutation. Gene concept: Fine structure of gene and gene concept, Fine structure analysis – Benzer's experiments, Complementation analysis and fine structure of gene, Complementation and recombination.

Unit: 3 17 Lectures

Sex Determination: Sex determination and Sex linked inheritance, Sex determination inhumans, *Drosophila* and other animals, Sex determination in plants, Sex linked genes and dosage compensation in human, *Drosophila* and *C.elegans.*

Unit: 4 16 Lectures

Extra-Chromosomal Inheritance: Chloroplast and Mitochondrial inheritance, Yeast, *Chlamydomonas/Neurospora*and higher plants, Symbiosis.

Suggested Reading:

1. Anthony, J.F., Miller, J.A. ,Suzuki, D.T., Richard, R.C., Gilbert, W.M. (1998).*An Introduction to Genetic Analysis*.W.H. Freeman publication, USA.
2. Atherly, A.G., Girton, J.R., Mcdonald, J.F. (1999).*The science of Genetics*.Saundern College publication.
3. Snusted, D.P., Simmons, M. J. (2010). *Principles of Genetics*. John Wiley & Sons, New York.
4. Gupta, P.K. (2009). *Genetics*. RastogiPublications, Meerut, India.
5. Gupta, P.K (2008). *Cytology, Genetics and Evolution*.RastogiPublications, Meerut, India.
6. Jocelyn, E.K., Elliott, S.G., Stephen, T.K. (2009).*Lewin's Genes X*. Jones and Bartlett Publishers, USA.
7. Schaum, W.D. (2000). *Theory & problems in Genetics by* Stansfield, outline seriesMcGrahill, USA.
8. Tamarin, R.H. (1996). *Principles of Genetics, International edtn.*McGrawhill, USA.
9. Sambrook, J., Fritish, E. F., Maniatis, T. (2012). *Molecular cloning: A laboratory manual*. Cold Spring Harbor Laboratory Press, New York.
10. Korf, B.R.(2013) *Human Genetics and Genomics*. Wiley-Blackwell

LML.510: Concepts and Prospects of Molecular Medicine. **Credits Hours: 4.**

Learning Objective: The students will understand the background of molecular medicine i.e. molecular/cell biology relevant to medical applications. It will enhance their understanding how normal cellular processes change, fail or are destroyed by disease development, in particular for genetic diseases and role of modern therapeutics.

Unit: 1 **18 Lectures**

Molecular Basis of Diseases: Human genetics relevant to molecular medicine, single nucleotide polymorphisms, multiple gene polymorphisms, single and multi-gene diseases, gene-environment interactions in disease manifestation.

Unit: 2 **18 Lectures**

Molecular Medicine Therapeutics: Gene therapy and recombinant molecules in medicine and therapeutic development, Antiviral therapies, vehicles for gene therapies, pharmacogenomics, its application and role in developing novel therapies. RNAi and human diseases, alternate splicing and human disease.

Unit: 3 **18 Lectures**

Signal Transduction and its Role in Human Diseases: Cellular and tissue microenvironment in diseases, drug resistance with convention chemotherapies, construction of knock-out and transgenic animals, Protein as causes of human diseases.

Unit: 4 **18 Lectures**

Clinical trials, adjuvant therapies, monoclonal antibodies as drugs, nano-biotechnology and its applications in molecular medicine, next generation sequencing techniques.

Suggested Reading:

1. Littwack, G. (2008). *Human Biochemistry and Disease*. Academic Press.
2. Trent, R. J. (2012). *Molecular Medicine,* Fourth Edition: Genomics to Personalized Healthcare. Academic Press.
3. Trent, R. J. (2005). *Molecular Medicine: An Introductory Text*. Academic Press.
4. Elles, R., Mountfield, R. (2011). *Molecular Diagnosis of Genetic Diseases*. Springer Publication.
5. Liciniio, J., Wong, M. L. (2003). *Pharmacogenomics: The Search for Individualized Therapies*. Wiley.
6. Audet, J.,Stanford, W.and Stanford,W. L. (2009) *Stem cells in regenerative medicine*.New York, Humana press.

LSP 503: Introduction to Biostatistics - Practical. Credit Hours: 1.

1. Experimental design and analysis.
2. Training on basic usage of Microsoft Word, Microsoft Excel, Microsoft PowerPoint and Internet Explorer.
3. Optimizing web search: Google advanced search, Boolean operators, Literature search using Google Scholar, HighWire.
4. Bibliography management and research paper formatting using reference software EndNote.
5. Performing statistics analyses using MS Excel Analysis toolpack.
6. Creating a functional website using HTML.
7. Basic programming using DOS batch files and Auto Hot Key.

*Practical will be conducted depending upon the available facility/.faculty

LSP 505: Introduction to Cell and Molecular Biology – Practical. Credit Hours: 1.

1. Preparation of mitotic & meiotic chromosomes.
2. Study of structure of cell organelles through electron micrographs.
3. Instrumental methods for cell biology-centrifugation, chromatography.
4. Immunofluorescence and fluorescent probes.
5. Sectioning of tissues (Plant and animal).
6. Histochemical techniques (Fixing, Processing, Staining).
7. Epifluoresence microscopy and Confocal Microscopy.
8. Basics of bacterial/mammalian cell culture

*More practicals may be conducted depending on the available facilities / faculties.

LSP 507: Basic and ClinicalBiochemistry – Practical. Credit Hours: 1.

1. Preparation of solutions, buffers, pH setting etc.
2. Amino acid and carbohydrate separations by paper & thin layer chromatography.
3. Quantitative Estimation of Proteins, Sugars, total lipids and amino acids.
4. Assay and estimation of different enzymes e.g. invertase, amylases, acid and alkaline phosphatases in plant seeds.
5. Principle and application of electrophoresis, Native, SDS PAGE.
6. Estimation of total phenolic compounds.
7. Extraction and estimation of vitamins.
8. Basic clinical tests like Urea, lipid profiling, SGOT, SGPT etc.

* More practicals may be conducted depending on the available facilities / faculties..

LSP 509: Concepts of Genetics - Practical. Credit Hours: 1.

1. Calculation of allele frequencies.
2. Calculating recessive gene frequency, Calculating frequency of sex –linked alleles.

3. Karyotyping of normal & abnormal chromosome sets.
4. Monohybrid and dihybrid ratios, Multiple alleles, Epistasis – Problems.
5. Inheritance patterns in Man – Numericals on Pedigree analysis- Autosomal patterns, X–linked patterns, Y–linked patterns.
6. Mitochondrial inheritance patterns.
7. To test PTC tasting ability in a random sample and calculate gene frequencies for the taster and non–taster alleles.
8. Identification of inactivated X chromosome as Barr body and drumstick.
9. Blood group typing using haemagglutination tests.
10. Studies of a Model organism: Identification of normal and mutant flies (Drosophila melanogaster) & Preparation of Drosophila polytene chromosomes.
11. To study fingerball and palmar dermatogylphics and calculate indices.
12. To test for colour blindness using Ishihara charts.
13. Molecular Mapping of Genes.

* More practicals may be conducted depending on the available facilities / faculties..

LMS.599 Credit Seminar **Credit Hours : 1.**

Learning Objectives: To read the recent scientific articles and prepare presentation on some recent topic of "Molecular Medicine" which will be helpful to overcome the presentation related fears and blunders.

Interdisciplinary Courses for Semester-I **Credit Hours : 2.**

(To be offered by faculties from other centres)

Course Code: Code shall be brought from the department whose course is undertaken by the student.

Learning Objective: To ensure holistic development of student's knowledge and perspective, a course from other department must be undertaken by the student. This course shall carry 2 credits and will be evaluated out of 50 Marks.

Central University of Punjab, Bathinda

Centre For Human Genetics and Molecular Medicine

M.Sc. Life Sciences Specialization in Molecular Medicine

Interdisciplinary Courses offered by Faculty of Molecular Medicine — Credit Hours : 2.

(To be offered in both the semesters throughout the year)

LML 511: Basics of Stem Cell Biology — Credits Hours: 2.

Learning Objective: To instill awareness on very basics of cell biology and enable the student to understand the concept of stem cells and their importance for disease therapeutics.

Unit: 1 — 9 Lectures

Basics of Cell Biology: Introduction to cell, different types of cells, prokaryotic, eukaryotic, plant, animal, microbial cells, somatic and germline cell types

Unit: 2 — 9 Lectures

Cellular Complexities: Evolution from single cell life to complex multicellular organisms, cell differentiation, cellular microenvironment, different types of human cells, cell signalling and its role in synchronized function of various tissues.

Unit: 3 — 9 Lectures

Stem Cells: Types of stem cells, pluripotent, multipotent stem cells and precursor cells, adult, fetal, cord blood and embryonic stem cells, induced pluripotent stem cells.

Unit: 4 — 9 Lectures

Stem Cells and Therapeutics: Stem cells applications in treating various diseases like diabetes, RA, Parkinson's, Alzheimer's, Stroke and brain injury repair, Spinal cord injuries, anti-cancer, heart infarction, vision and hearing repair, teeth replacement, tissue replacements, skin grafting and wound healing.

Suggested Reading:

1. Alberts, B. Bray, D. Lews, J., Raff, M., Roberts, K. and Watson, J.D. (2014). *Molecular Biology of the Cell*. Garland publishers, Oxford.
2. Celis, J.E (2012). *Cell biology: A laboratory handbook*, Vol 1, 2, 3. Academic Press, UK.
3. Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. John Wiley & Sons. Inc., New Delhi, India
4. Alimoghaddam, K. (2013). *Stem Cell Biology in Normal Life and Diseases*. INTECH publications.
5. Lanza R., Gearhart,J., Hogan,B.,Melton,D., Pedersen, R., Thomas,E.D., Thomson, J., Wilmut, I. (2013).*Essentials of Stem Cell Biology* (Second Edition).

LML.512: Introduction to Immune System — Credits Hours: 2.

Learning Objective: To instill awareness on very basics of immune system ,where student will learn the components of the human immune response that work together to protect the host.

Unit: 1 — 9 Lectures

Elements of Immune System: Cells, Organs, and microenvironments of the immune system. Innate and adaptive immunity, cellular and humoral immunity, inflammatory and regulatory networks and small biochemical mediators (cytokines).

Unit: 2 — 9 Lectures

Functions of Immune System: Discriminate between self and non-self. A functional immune system confers a state of health through effective elimination of infectious agents (bacteria, viruses, fungi, and parasites) and through control of malignancies by protective immune surveillance.

Unit: 3 — 9 Lectures

Immunodeficiency and Dysfunction as the Basis of Disease: Immune Deficiencyand dysfunction diseases. Because specific mechanism affects prognosis as well as therapeutic approaches, Gel and Coombs classified these dysfunctional immune responses into hypersensitivitydiseases.

Unit: 4 9 Lectures

Immunological Processes and Therapeutics

Suggested Reading:

1. Abbas. (2010). *Cellular and Molecular Immunology*.CBS Publishers & Distributors, India.
2. Charles, A. and Janeway, J. R. (1994). *Immunobiology: The Immune system in health and disease*. Bl ackwell Publishing, USA.
3. Delves, P. J., Roitt, I. M. and Seamus, J. M. (2011). *Roitt's Essential Immunology (Series– Essentials)*. Bl ackwell Publishers, USA.
4. Elgert, K. D. (2009). *Immunology: Understanding the immune system*. Wiley-Blackwell, USA.
5. Kindt, T. J., Osborne, B. A. and Goldsby, R. A. (2007). *Kuby Immunology* 7th Edition. W. H. Freeman, USA.
6. Sawhney, S. K. and Randhir, S. (2005). *Introductory Practical Biochemistry*. Alpha Science International Ltd. New Delhi, India.
7. Tizard. (2009). *Immunology: An Introduction*. Cengage Learning, Thompson, USA
8.Owen, Judith A.; Punt, Jenni, Stranford, Sharon A.*Kuby's Immunology* (2013), W.H. freeman and company: New York, 2013.

LML. 513: Introduction to Human Cancers **Credits Hours: 2.**

Learning Objective: Introduction to human Cancers course is designed as an interdisciplinary course to acquaint the students of different streams of Life Sciences with a basic knowledge and understanding about various cancers.

Unit:1 **18 Lectures**

History, features of cancer including tumorigenesis and metastasis, Different types of cancers, symptoms of cancer, various methods for the detection of cancer, treatment of cancer, surgery and chemotherapy and targeted cancer therapy, institutes of national and international importance involved in cancer patient care and basic cancer research, application of new technologies in prevention, Tumor suppressors and oncogenes

Unit: 2 **18 Lectures**

Role of hormones and growth receptors as carcinogens in tumorigenesis and metastasis, environmental mutagens, occupational cancers, role of modern industry in carcinogenesis, effect of environmental pollutants on tumor suppressor genes, effect of cancer on the functioning of cell machinery, lifestyle changes, stress and cancer, importance of molecular biology in basic cancer research, socioeconomic impact of cancer.

Suggested Reading:

1. Airley, R. (2010). *Cancer Chemotherapy: basics to clinic*. Willey-Blackwell publishing, New Jersey.
2. DeVita, V. T., Hellman, S., Rosenberg, S. A. (2011). *Cancer: principles and practice of oncology*. Lippincot Williams and Wilkins Publishers, Philadelphia.
3. Enders, G. H. (2010). *Cell cycle deregulation in cancer*. Humana Press, Springer science, New York.
4. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009). *Lewin's Gene X*. Jones &Barlett.
5. Wang, E. (2010). *Cancer Systems Biology*. CRC press, Taylor & Francis group, New York.
6. Weinberg, Robert A.. (2007). *The Biology of Cancer*. New York: Garland Science

Related Weblinks:

http://www.insidecancer.org/
http://www.cancer.gov/publications/patient-education
http://www.who.int/cancer/en/
http://www.cancer.gov/
http://www.icmr.nic.in/ncrp/cancer_reg.htm

	Semester-II						
S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	LSL.521	Human Physiology	C	3	-	-	3
2	LSL.523	Essentials of Immunology	C	3	-	-	3
4	LML.524	Advanced Techniques in Human Genetics and Molecular Medicine	F	3			3
5		Elective Course-I	E	3			3
6		Elective Course-II	E	4			4
7		Interdisciplinary course-2	ID	2			2
8	LSP.522	Human Physiology (P)	C	-	-	2	1
				18	-	2	19
	Elective Course-I						
	LML.525		Regenerative Medicine and Stem Cell Therapies	3	-	-	3
	HGL.525		Human Embryology and Developmental Genetics	3	-	-	3
	Elective Course-II						
	LML.526		Molecular and Cellular Oncology	4	-	-	4
	LML.527		Molecular Endocrinology and Signal Transduction	4	-	-	4
	HGL.526		Population Genetics and Genetic Epidemiology	4	-	-	4

LSL.521: Human Physiology. **Credit Hours: 3.**

Learning Objective: This course is designed to provide students with an understanding of the function and regulation of the human body and physiological integration of the organ systems to maintain homeostasis. Course content will include neural & hormonal homeostatic control mechanisms, as well as study of the musculoskeletal, circulatory, respiratory, digestive, urinary, immune, reproductive, and endocrine organ systems.

Unit: 1 14 Lectures

Muscle Physiology: Types of muscles, Properties; Contractile force; Motor Unit. Skeletal, cardiac and smooth muscles.

Cardiovascular System: Myogenic heart, Cardiac cycle, Heart as a pump, blood pressure, neural and chemical regulation of all above, Blood cell synthesis and Bone marrow, Haemopoiesis and formed elements, Plasma function, Blood volume and its regulation, Blood groups, Haemoglobin, Haemostasis, blood associated diseases.

Unit: 2 12 Lectures

Digestive System: Digestion, absorption, energy balance, BMR, Epithelial Barrier Function, Regulation of Swallowing and Gastric Emptying and small/ Large Bowel. Gastro-intestinal Secretions and accessory glands

Respiratory System: Anatomical considerations, Transport of gases, Exchange of gases, Waste elimination, Neural and chemical regulation of respiration. Alveolar Ventilation, Diffusion across alveoli, Transport of respiratory gases in blood. The Respiratory System under Stress: Altitude, Hypoxia

Excretory System: Comparative physiology of excretion, Kidney, Urine formation, Urineconcentration, Waste elimination, Micturition, Regulation of water balance, Electrolyte and acid-base balance. Renal Function and Hemodynamics

Unit: 3 **14 Lectures**

Nervous System: Neurons, action potential, Gross neuroanatomy of the brain and spinal cord, Central and peripheral nervous system, Neural control of muscle tone and posture. **Sense organs:** Vision, hearing and tactile response.

Thermoregulation and Stress Adaptation: Comfort zone, Body temperature – physical, chemical, Neural regulation, Acclimatization.

Unit: 4 **14 Lectures**

Endocrinology: Endocrine glands, Hormone Structure and Function, Basic mechanism of hormone action, Hormones and diseases, Reproductive processes, Neuroendocrine regulation.

Reproduction: Males and female reproductive system. Gametogenesis, fertilization and early development.

Suggested Reading:

1. Brody, T. (1998). *Nutritional biochemistry*. Academic Press, USA.
2. Devlin, T.M. (2005). *Textbook of Biochemistry with Clinical Correlations*. John Wiley &Sons Inc. USA.
3. Guyton. (2007). *Textbook of medical physiology*. 11th Edition. Elsevier India Pvt. Ltd. NewDelhi.
4. Hill, R.W, Wyse, G. A. and Anderson, M. (2008). *Animal Physiology*. Sinauer Associates Inc. USA.
5. Khurana. (2006). *Textbook of Medical Physiology*. Elsevier India Pvt. Ltd.
6. Murray, R.K. (2009). *Harper's Illustrated Biochemistry*. Jaypee Publishers, New Delhi,India.
7. Tyagi, P. (2009). *A Textbook of Animal Physiology*.Dominant Publishers and distributors,New Delhi, India.
8. Silverthorn D, (2011)*Human Physiology*, Pearson; 6th edition.
9. Sherman V. (2013)*Vander's Human Physiology*. McGraw-Hill 13th edition.

LGL 523 Essentials of Immunology. **Credit Hours:3.**

Learning Objective: The objective of this course is to cover basic concepts of immune system and to understand the concept of immune-based diseases as either a deficiency of components or excess activity as hypersensitivity.

Unit: 1 **12 Lectures**

Immune System: The cells and organs of immune system. Recognition of self and nonself, Humoral immunity-immunoglogulins, basic structure, classes and subclasses, structural and functional relationships, nature of antigen, antigen-antibody reaction, estimation of affinity constants. Molecular mechanisms of antibody diversity and Cellular immunity: Organization of genes coding for constant and variable regions of heavy chains and light chains. Mechanisms of antibody diversity, class switching. Lymphocytes, cytokines, interferons, Interlukins, antigen recognition-membrane receptors for antigens.

Unit: 2 **10 Lectures**

Immune Effectors: Complement system, their structure, functions and mechanisms of activation by classical, alternative and lectin pathway. Th1 and Th2 response, cytokines, Chemokines.Antigen and antibody interactions

Unit: 3 **10 Lectures**

Mechanisms of Immune System Diversity: Organization and expression of immunoglobulin genes, Mechanisms of antibody diversity, class switching. Structure and functions of Major Histocompatibility Complex (MHC) and Human Leukocyte Antigen (HLA) system, polymorphism, distribution, variation and their functions.Organization and rearrangement of T-cell receptor genes (TCR).

Unit: 4 12 Lectures

Immune System in Health and Diseases: Inflammation, hypersensitivity and autoimmunity, Immunity to microbes, immunity to tumors, AIDS and immunodeficiencies, hybridoma technology and vaccine development associated challenges for chronic and infectious diseases. Production, characterization and applications of monoclonal antibodies in diagnosis, therapy and basic research, concept of making immunotoxins.

Suggested Reading:

1. Kindt, T.J., Osborne, B.A. and Goldsby, R.A. (2007). *Kuby Immunology*. 7th Edition. W.H. Freeman, USA.
2. Abbas. (2008). *Cellular and Molecular Immunology*.CBS Publishers & Distributors, India.
3. Charles, A. and Janeway, J.R. (1994). *Immunobiology: The immune system in health and disease*. Blackwell Publishing, USA.
4. Delves, P.J., Roitt, I.M. and Seamus, J.M. (2006). *Roitt's Essential Immunology (Series-Essentials)* Blackwell Publishers, USA.
5. Elgert, K.D. (2009). *Immunology: Understanding the immune system*. Wiley-Blackwell, USA.
6. Paul, W.E. (1993). *Fundamental immunology*. Raven Press, SD, USA.
7. Sawhney, S.K. and Randhir, S. (2005). *Introductory Practical Biochemistry*. Alpha Science International Ltd. New Delhi, India.
8. Tizard. (2008). *Immunology: An Introduction*. Cengage Learning, Thompson, USA.
9. Owen, Judith A.; Punt, Jenni, Stranford, Sharon A. *Kuby's Immunology* (2013), W.H. Freeman and Company: New York, 2013

LSL 524: Advanced Techniques in Human Genetics and Molecular Medicine **Credit Hours: 3.**

Learning Objective: This course will help the students to understand safe laboratory practices and basic molecular biology techniques and specialized molecular and cell biology techniques.

Unit 1 10 Lectures

Biochemical Techniques: Sterilization techniques, Spectrometry: Colorimetry, mass, UV, IR, NMR and atomic absorption spectrophotometery, Centrifugation: Principle and applications, Ultracentrifugation. Chromatography: Principle, procedure and applications of thin layer chromatography (TLC), gel filtration and ion exchange, affinity chromatography, GC, GLC, HPLC and FPLC.

Unit:2 12 Lectures

Microscopy: Light microscopy, phase contrast microscopy, fluorescent microscopy, scanning electron microscopy (SEM/FESEM), transmission electron microscopy (TEM), micrometry and photomicrography, Histochemistry, Scanning-probe microscopy, Atomic force microscopy, CLSM.

Unit:3 6 Lectures

Proteins and Nucleic Acids: Isolation, purification and analysis of nucleic acids. Electrophoresis: Principle of gel electrophoresis, polyacrylamide gel electrophoresis (PAGE and SDS-PAGE), agarose gel electrophoresis, pulse field gel electrophoresis (PFGE) and Two-Dimensional gel electrophoresis.

Polymerase chain reaction (PCR): Principle, types and applications, PCR based markers: RAPDs, SSRs, SNPs, ISSRs, and SCARs etc. Blotting techniques: Southern, Northern, Western, Dot blotting and hybridization, DNA fingerprinting.

Unit: 4 10 Lectures

Cell culture and Related Techniques: Sterile culture practices, Cell sorting, Hybridoma technology/Production of antibodies, Flow cytometry, Histochemical and Immunotechniques, Immunochemical Techniques, Developing Monoclonal and Polyclonal antibodies, Immunocytochemistry, Radioimmunoassay (RIA), Enzyme Linked Immunosorbent Assay (ELISA).

Suggested Reading:

1. Brown, T.A. (2010). *Gene cloning and DNA analysis: An Introduction*. 6th Edition, Wiley-Blackwell Publisher, New York.
2. Goldsby, R.A., Kindt, T.J. and Osborne, B.A. (2008). *Kuby Immunology*. 6th Edition, W. H. Freeman & Company, San Francisco.
3. Gupta, P.K. (2005). *Elements of biotechnology*.Rastogi Publications, Meerut.
4. Gupta, S. (2005). *Research methodology and statistical techniques*, Deep & Deep Publications (P) Ltd.New Delhi.
5. Lewin, B. (2010). *Genes X*, CBS Publishers & Distributors. New Delhi.
6. Nelson, D. and Cox, M.M. (2009). *Lehninger Principles of Biochemistry*. W.H. Freeman and Company, New York.
7. Primrose. S.B. and Twyman, R. (2006). *Principles of Gene Manipulation and Genomics*.Blackwell Publishing Professional, U.K.
8. Sambrook, J. (2006). *The Condensed Protocols from Molecular Cloning: A Laboratory Manual*.Cshl Press. New York.
9. Sambrook, J., Fritish, E.F., Maniatis, T. (2012). *Molecular cloning: A laboratory manual*. Cold Spring Harbor Laboratory Press, New York.
10. Sawhney, S.K. and Singh, R. (2005). *Introductory Practical Biochemistry*.Narosa Publishing House, New Delhi
11. Slater, A., Scott, N.W. and Fowler, M.R. (2008). *Plant Biotechnology: The Genetic Manipulation of Plants*. Oxford University Press, USA.

LSP.522: Human Physiology – Practical. Credit Hours: 1.

1. Sensory physiology practicals
2. Equipment in the laboratory - maintenance and use.
3. Determination of hemoglobin in the blood by various methods.
4. Isolation and estimation of DNA and RNA.
5. Extraction and estimation of acid phosphatases from serum.
6. Enzyme-linked Immunosorbent assay (ELISA).
7. Electrophoresis of egg proteins.
8. Determination of urea and uric acid in the urine.
9. Estimation of glucose by different methods.

*More practicals may be conducted depending on available faculties/facilities.

Elective Course-I Credit Hours: 3.

Students has to choose 1 out of 2 elective course

LML.525:Regenerative Medicine and Stem Cell Therapies. Credit Hours: 3.

Learning Objective: To teach students the advanced techniques in medicine in gene and molecular therapeutics. The students will understand basic stem cell biology and corresponding requirement for tissue engineering.

Unit: 1 16 Lectures

Stem Cells: Stem cells and their properties, classification of stem cells: Hematopoietic Stem Cells, mesenchymal Stem Cells, Embryonic Stem Cells, Fetal Stem Cells, adult stem cells, cancer stem cells, *in-vitro* culture techniques, isolation, identification and characterization of stem cells, stem cells in gastrointestinal , liver, pancreas, kidney, heart, spinal cord, eye diseases and cancer.

Unit: 2 16 Lectures

Tissue Engineering: Principles of tissue culture, tissue and organ culture, extracellular matrices, bioreactors, ethical issues related to stem cell therapies, stem cell banks, bone marrow transplantation.

Unit: 3 **20 Lectures**

Regenerative Medicine: Modes of tissue and organ delivery, tissue Engineering and transplantation techniques, immunoisolation techniques, regeneration of bone and cartilage, Islet cell transplantation and bio-artificial pancreas, lung regeneration

Unit: 4 **20 Lectures**

Somatic and Germline Engineering: Basics of cell culture and media, Culturing primary cells and cell lines, suspension and adherent cultures, cell growth, growth inhibition and apoptotic studies, Embryo culture, transplantation and teratogenesis, teratomas. Stem cell culture, organ culture, artificial blood, Somatic cell fusion and somatic cell genetics, radiation hybrids.

Suggested Reading:

1. Lanza, R., Gearhart,J. (2009). *Essential of Stem Cell Biology*. Elsevier Academic Press.
2. Lanza, R., Klimanskaya, I. (2009). *Essential Stem Cells Methods*. Academic Press.
3. Mao, J. J., Vunjak-Novakovic (2008). *Translational Approaches in Tissue Engineering & Regenerative Medicine*.Artech House INC Publications.
4. Lanza, R. (2007). *Principles of Tissue Engineering, 3rd Edition*. Academic Press.
5. Stein. (2011). *Human Stem Cell Technology and Biology: A Research Guide and Laboratory Manual*. Wiley-Blackwell.
6. Lanza, R. (2004). *Handbook of Stem Cells, Two-Volume Set: Volume 1-Embryonic Stem Cells; Volume 2-Adult and Fetal Stem Cells*. Academic Press.

Related Weblinks:

1. www.stemcells.wisc.edu
2. http://stemcells.nih.gov/info/scireport/Pages/2006report.aspx
3. *stemcells.nih.gov/*
4. http://instem.res.in/

HGL.525: Human Embryology and Developmental Genetics Credit Hours: 4.

Unit: 1 **18 Lectures**

Reproductive Physiology: Structure and Functions of Adult Human Reproductive organs, Reproductive Endocrinology,Gametogenesis: Formation of male and female gametes, Embryogenesis: Fertilization, Gastrulation and Implantation of Embryo, Lactation.

Unit: 2 **18 Lectures**

Basic Concepts of Development: Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells; genomic equivalence and the cytoplamic determinants; imprinting; mutants and transgenics in analysis of development.

Unit: 3 **18 Lectures**

Regulation of Organ Development: Genetic and molecular control of development of limbs, Gastrointestinal system and cardiovascular system; Genetics of sex determination in humans and development of urogenital system; Programmed cell death and role of cell death in formation of digits and joints, Genetic and molecular control of development of head and neck region, Formation of nervous system.

Unit: 4 **18 Lectures**

Post-natal Development, Aging and Senescence: Environmental and genetic factors during maturations. Sex linked changes. Deciduous *and* primary teeth. Cognitive development ageing: its causes and regulation; Clinical death.

Suggested Reading:

1. Green, D. R. & Reed J. C. (2010). *Apoptosis: Physiology and Pathology*. Cambridge press, UK.
2. Milunsky, J. &Milunsky, A. (2010). *Genetic Disorders and the Fetus: Diagnosis, Prevention & Treatment*. Willey Blackwell India, New Delhi.
3. Nussbaun, R., Roderick, R. M. and Huntington, F.W.(2007). *Genetics in Medicine*. Saunders Elsevier Philadelphia.
4. Prakash, G. (2007). *Reproductive Biology*. Narosa Publication House Pvt. Ltd.,-New Delhi.
5. Sadler, T.W., Tosney, K., Chescheir, N.,C., Imseis, H., Leland, J. and Sadler-Redmond, 'S.,L. (2011).*Langman's Medical Embryology (Longmans Medical Embryolgy)*. Lippincott Williams and Wilkins.
6. Schaefer, B.*D. (2013). Medical Genetics: An integrated Approach.* McGraw Hill Education, New Delhi.
7. Tyagi R. (2011). *Understanding Evolutionary Biology*. Discovery Publication House Pvt. Ltd., New Delhi.

Elective Course-II **Credit Hours: 3.**

Students has to choose 1 out of 3 elective course

LML. 526: Molecular and Cellular Oncology **Credit Hours: 3.**

Learning Objective: Cancer Biology course is designed as an elective course to equip the students of different streams of Life Sciences with a conceptual understanding and advanced comprehension to cope up with the ever-expanding role of molecular biology in basic cancer research as well as clinical oncology.

Unit: 1 **18 Lectures**

Fundamentals and Genetics of Cancer: History, hallmarks of cancer research, cancer classification, Mutagens, carcinogens and gene mutations and genetic arrangements in progenitor cells. Chromosomal aberrations, tumor viruses and discovery of oncogenes, Mechanism of activation of oncogenes. Transcription factors as tumor suppressors and oncogenes, Familial cancer syndromes, telomere regulation in cancer, micro RNA profiling in cancer, cancer stem cells.

Unit: 2 **18 Lectures**

Signal Transduction in Cancer Progression: Role ofgrowth factors and receptors in carcinogenesis, Interaction of cancer cells with variety of immune cells. Deregulation of Cell cycle in cancer. Role of p53 and pRb in cell cycle, Apoptosis and tumor suppressor p53, mitochondrial signaling, RAS signaling in cancer, cancer metabolism, hypoxia and metastasis, angiogenesis, tumor microenvironment. DNA damage and repair mechanisms, DNA repair defects and their relation to cancer.

Unit: 3 **18 Lectures**

Cancer Detection: General and organ specific symptoms associated with cancer, techniques for cancer detection, biomarkers for cancer detection of various stages of cancer, population genetics based screening methods, *In-vitro* assays to detect angiogenesis, metastasis, cell proliferation, mice models to study cancer (transgenic, knock-out, knock-in, xenografts and patient derived xenografts), genomic and proteomic approaches to develop better cancer markers.

Unit: 4 **18 Lectures**

Cancer Therapies and Recent Advances in Cancer Research : Traditional Chemotherapies, radiotherapy, Onco-surgery, Bone marrow transplantation, stem cell therapies, Immunotherapy, combinational therapies, natural products as therapeutics, cancer vaccines, gene therapies and delivery vehicles, targeted anticancer therapies,

monoclonal antibody & adjuvant therapies. System biology approaches, Application of new technologies in prevention, assessing risk, diagnostics and treatment.

Suggested Reading:

1. Airley, R. (2010). *Cancer Chemotherapy: basics to clinic.* Willey-Blackwell publishing, New Jersey.
2. DeVita, V. T., Hellman, S., Rosenberg, S. A. (2011). *Cancer: Principles and Practice of Oncology.* Lippincot Williams and Wilkins publishers, Philadelphia.
3. Enders, G. H. (2010). Cell *cycle deregulation in cancer.* Humana Press, Springer science, New York.
4. Grutzmann, R., Pilarsky, C. (2010). *Cancer Gene Profiling: Methods and Protocols.* Humana Press, Springer science, New York.
5. Gusev, Y. (2010). *Micro RNA Profiling in Cancer.* Pan Standford publishing pvt.Ltd., Singapore.
6. Hiem, S., Mitelman, F. (2009). *Cancer Cytogenetics.* IIIrd edition. Willey-Blackwell publishing, New Jersey.
7. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009). *Lewin's Gene X.* Jones &Barlett.
8. Wang, E. (2010). *Cancer systems biology.* CRC press, Taylor & Francis group, New York.
9. Weinberg, Robert A. (2007). *The Biology of Cancer.* New York: Garland Science

Related Weblinks
http://www.insidecancer.org/
http://www.who.int/cancer/en/
http://www.cancer.gov/
http://www.icmr.nic.in/ncrp/cancer_reg.htm

LML.527: Molecular Endocrinology and Signal Transduction **Credit Hours: 3.**

Learning Objective: The course is designed for the students of life sciences who are interested to learn the basics of signal transduction and its role in various cellular processes. Various pathways deregulated during disease manifestation will also be discussed in detail.

Unit 1 **15 Lectures**

History, endocrine glands, and hormones as chemical messengers, stimulus for hormone release: change in homeostasis, sensory stimulus and others.

Cell Signaling and Mechanism of Hormone Action: Receptor study, Binding affinity, specificity, Scatchard plot and purification. G protein linkedreceptor family; Signal transduction pathways involving G-proteins, Adenylcyclases, Ca^{+2} ,Phosphoinositides, PI-3 Kinase, DAG, cAMP, cGMP, NO, Protein kinases (A,B,C,G), Phosphoprotein phosphatases &Phosphodiesterases. Receptor tyrosine kinase family- EGFreceptor family, Insulin receptor family, & Cytokine/erythropoietin receptor family associated with non-receptor Tyrosine kinase (Signal transduction pathways involving: SH2 proteins, Ras, IRS-1, Raf, MEK, MAP kinase, JAK-STAT pathway).

Unit 2 **15 Lectures**

Hormones: Structures, Receptor type, Regulation of biosynthesis and release (including feedback mechanism). Physiological and Biochemical actions, & Pathophysiology (hyper & hypo secretion). Hypothalamic Hormones: CRH, TRH, GnRH, PRL/PRIH, GHRH/GHRIH Pituitary Hormones - Anterior Pituitary hormones- Growth hormone, Prolactin, POMC peptide family, LH, FSH, TSH; Posterior Pituitary: Vasopressin, Oxytocin.

Unit 3 **15 Lectures**

Endocrine disorders: Gigantism, Acromegaly, dwarfs, pigmies; Pathophysiology: Diabetes insipidus. Thyroid Hormone (include biosynthesis) Goiter, Graves disease, Cretinism, Myxedema, Hashimoto's disease. Pancreatic Hormones: Insulin, Glucagon, Diabetes type I & II. Hormones associated with obesity: Ghrelin, Leptin.

Unit: 4 **15Lectures**

Reproductive Hormones: Male & female Sex hormones. Origin of GnRH cells, migration and site of release, reproductive cycles in females. Chemotrophic factors involved during early GnRH development and adult GnRH System. Interplay of hormones during Reproductive cycle, Pregnancy, Parturition, & Lactation. Other organs with endocrine function: Heart (ANP), Kidney (erythropoietin), Liver (Angiotensinogen, IGF-1), Adipose tissue (Leptin, adiponectin).

Suggested Reading:

1. Norris, D.O., and Carr, J.A. *Vertebrate Endocrinology*, 5th Edition. Academic Press, 2012.
2. Nelson, David L., and Cox, Michael M., Lehninger *Principles of Biochemistry*, 5th Edition. WH Freeman & Company, New York, 2008.
3. Widmaier, E.P., Raff, H., and Strang, K.T. *Vander's Human Physiology*, 13th Edition. McGraw-Hill Higher Education, 2013.
4. Lodish, H., Berk, A., Kaiser, C.A., Krieger, M., Bretscher, A., Ploegh, H., Amon, A., and Scott, M.P. *Molecular Cell Biology*, 7th Edition. W.H. Freeman, 2012

HGL. 526:Population Genetics and Genetic Epidemiology — Credit Hours: 4.

Course Objectives: Study of population genetics is necessary to understand the evolution. This course will be helpful to the students to conceptualize the existence of genetic variation and speciation. Further, this course will give students exposure towards understanding population health and disease susceptibility.

Unit 1 **18 Lectures**

Population dynamics and Fundamental of Epidemiology: Dynamics and conditions of the Hardy-Weinberg law; Selection coefficient and fitness; Heterozygous advantages, Inbreeding and its consequences; Mutation pressure and estimation of rates, Genetic load, Selection coefficient and Fitness, Dynamics of migration and genetic drifts.

Unit: 2 **12 Lectures**

Introduction of different types of epidemiological studies: Experimental and observational; Cohort studies; Association studies, genome-wide association studies (GWAS), general approaches to access the genetic basis of disease; heritability; basic parameters of epidemiology: frequency, occurrence, prevalence, Incidence; Association; variation;

Unit: 3 **12 Lectures**

Population and Speciation: Adaptive radiation; Isolating mechanisms; Speciation; Allopatricity and Sympatricity; convergent evolution; sexual selection; co-evolution.

Unit: 4 **12 Lectures**

Genetic Variation and Inheritance of Complex Traits: Basics of genetic variation, Genetic markers – SNP, CNV, Indels, VNTR, STR, Microsatellite. Tag markers and Haplotypes, Linkage disequilibrium, Fixation index; Quantitative Genetic analysis; Broad-Sense Heritability and Narrow-Sense Heritability.

Suggested Reading:

1. Bhasker, H.V. and Kumar S (2008). *Genetics*. Campus Books International, New Delhi, India.
2. Cavalli-Sforza, L.L. and Bodmer, W.F. (2013). *The Genetics of Human Populations*. Dover Publications.
3. Hamilton M.B. (2009). *Population Genetics*. Wiley-Blackwell, UK.
4. Hedrick P.W.(2011). *Genetics of Populations*. Jones and Bartlett Publishers, Massachusetts.

5. Jobling, M., Hollox, E., Hurles, M., Kivisild, T. and Tyler-Smith, C. (2013). *Human Evolutionary Genetics*. Garland Science.
6. Knight, J.C. (2009). *Human Genetic Diversity –Functional consequences for Health and Disease*. Oxford University Press, USA.
7. Krebs, J.E, Goldstein, E.S. and Kilpatrick, S.T. (2013) *Lewin's Essential Genes*. Jones and Bartlett learning, USA.
8. Nielsen, R. and Slatkin, M. (2013). An Introduction to Population Genetics: Theory and Applications. Sinauer Associates, Inc.
9. Relethford, J.H. (2012). *Human Population Genetics*. John Wiley & Sons.
10. Snusted, D.P., Simmons, M. J. (2010). *Principles of Genetics*. John Wiley & Sons, New York.
11. Palmer LJ, Burton PR and Smith GD (2011): An introduction to genetic epidemiology (Policy Press, University of Bristol)
12. Dawn TM (2011): Genetic Epidemiology (Springer)
13. Austin M (2013): Genetic Epidemiology: Methods and Applications, 1st Edition (CABI Publishing)

Semester-III								
S.No	Course Code	Course Title	Course Type		L	T	P	Cr
1	LSL.601	Medical Microbiology	C		2	-	-	2
2	LML.602	Molecular Basis of Human Diseases	C		4	-	-	4
3	LSL.603	Bioinformatics and Computational Biology	C		4	-	-	4
4		Elective Course-III	E		3			3
5		Elective Course-IV	E		4	-	-	4
6	LMD.600	Dissertation					16	8
					17	0	8	25
Elective Course-III								
	LML.604	Evolutionary and Developmental Biology			3	-	-	3
	HGL.604	Genetic Diseases and Therapies			3	-	-	3
Elective Course-IV								
	LML.605	Radiation Biology			4	-	-	4
	HGL.605	Aging, Longevity and Health			4	-	-	4

LSL.601: Medical Microbiology. **Credit Hours: 2.**

Learning Objective: The student will learn the mechanism of infectious diseases their causes, detection, molecular diagnosis and possible therapeutics.

Unit: 1 **10 Lectures**

Prokaryotic, Eukaryotic structure and function: Cell structure and function, Classifications. Bacteria, Fungi, Protozoa, Algae, and viruses, Structure of major viruses, and Viral replication.

Unit: 2 **8 Lectures**

Growth, Nutrition and Control: Phases in bacterial growth, Growth Curve, Calculation of G-time, Physical and environmental requirements of growth, Microbial nutritional requirements, Types of culture media. Physical and Chemical methods, Antimicrobial drugs, Antibiotic assays, Drug resistance in bacteria.

Unit: 3 **6 Lectures**

Microbial Genetics: DNA replication, Transcription and translation, Operon, Horizontal Gene Transfer.

Host-pathogen Interactions: Infectious diseases, host-pathogen interactions, genetic susceptibility to infection. Entry of pathogens into the host; colonization and factors predisposing to infections; types of toxins and their structure; Mode of actions, host signalling in response to infections, bacterial two component signaling systems, bacterial adhesins, virulence factors, bacterial biofilms and applications

Unit: 4 **12 Lectures**

Applied Microbiology: Environmental microbiology, Microbial ecology, Aquatic Microbiology, Food, Dairy and Agricultural Microbiology, Industrial Microbiology. Major bacterial diseases of animals and plants, Airborne, Food-borne, Soil-borne, Nosocomial and Sexually Transmitted/Contagious Diseases, Principles of disease and epidemiology, Host-Microbe relationship, Viral pathogenesis, Major viral diseases of plants and animals.Avian Influenza A/H5N1, A/H1N1 Swine Influenza, SARS, AIDS, Japanese encephalitis, Malaria and Tuberculosis, West Nile, Mechanisms of emergence and reemergence.

Suggested Reading:

1. Bauman, R.W. (2011). *Microbiology with Diseases by Body System*. Benjamin Cummings, USA.
2. Capuccino, J.G. and Sherman, N. (2004). *Microbiology-A Laboratory Manual*. Benjamin Cummings, USA.
3. Pelczar, M. J., Chan, E.C.S. and Krieg, N.R. (1993). *Microbiology: Concepts and Applications*. McGraw-Hill Inc USA.
4. Pommerville, J.C. (2010). *Alcamo's Fundamentals of Microbiology*. Jones & Bartlett Publishers, USA.
5. Prescott, L.M., Harley, J.P. and Klein, D.A. (2004). *Microbiology*. McGraw-Hill Science, USA.
6. Strelkauskas, A., Strelkauskas, J. and Moszyk-Strelkauskas, D. (2009). *Microbiology: A Clinical Approach*.Garland Science, New York, USA.
7. Tortora, G.J., Funke, B.R. and Case, C.L. (2009). *Microbiology: An Introduction*.Benjamin Cummings, USA.

LML.602: Molecular Basis of Human Diseases. **Credit Hours: 4.**

Learning Objective: This course aims to provide students with in-depth knowledge of the basic mechanisms of common human diseases, such as cancer, diabetes, obesity, metabolic syndrome and muscle wasting conditions and to prepare them for future translational research. This course focuses on the current molecular mechanisms underlying the pathogenesis of each disease.

Unit: 1 16 Lectures

Molecular basis of the diseases, their susceptibility, progression and prognosis with a focus on developing betterdiagnostics and new therapeutics for human genetic disorders, cardiomyopathies, cancers, chronic inflammatory disorders, including inflammatory bowel disease and rheumatoid arthritis and infectious diseases. Role of factors such as life style, diet and heredity in the human diseases.

Unit: 2 18 Lectures

Genetic disorders: Common genetic disorders due to altered chromosome numbers, aberrations; Diabetes as a genetic disease, recessive genetic disorders, Intersex Disorders:Male Pseudo-hermaphrodite (MPH) including testicular feminization syndrome, Female Pseudo-hermaphrodite (FPH) including congenital adrenal hyperplasia, True Hermaphrodites (TH), Mixed gonadal dysgenesis (MGD) & Dysgenetic male pseudohermaphrodite (DMP) and Persistent Mullerian duct syndrome (PMDS), diabetes and other complex human diseases.

Unit: 3 16 Lectures

Disorders of Haematopoitic and Muscular System and Multifcatorial diseases: Haematopoietic systems - Sickle cell anemia, Thalassemias and Haemophilias and Haematopoietic Malignancies. Muscular Dystrophy. Molecular and genetic basis of Diabetes, Dementia, Schizophrenia, Cancer, Coronary Artery diseases, Hypertension and neuronal disorders such as Autism, Alzheimer's and Parkinson. Mental Retardation.

Unit: 4 20 Lectures

Mechanisms of Infection and Therapeutic Interventions: Protein and DNA secreting systems and pathogenicity island. Molecular basis of antimicrobial resistance and its detection. Molecular approaches in clinical microbiology, antimicrobial agents; Sulfa drugs; Antibiotics: Penicillins and Cephalosporins; Broad-spectrum antibiotics: Antibiotics from prokaryotes; Antifungal antibiotics; Mode of action; Resistance to antibiotics.

Novel therapies for diseases: Tyrosine kinase inhibitor, Monoclonal antibody, Chemo, Radio, Gene and Stem Cell Therapies,Anticancer drugs targeting genomic DNA, radiations to kill abnormal cells, gene therapies in various diseases, problems in gene therapy, ethical and biosafety issues in gene therapies, current stem cell therapies, stem cells in heart, brain and spinal cord regeneration.

Suggested Reading:

1. Patch, H. S. C. (2009). *Genetics for the Health Sciences*. Scion Publishing Ltd., UK.

2. Brown, S. M., (2009). *Essentials of Medical Genomics*. Wiley-Blackwell.
3. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009). *Lewin's Gene X*. Jones &Barlett.
4. Milunsky, A., Milunsky, J. (2009). *Genetic Disorders and the Fetus: Diagnosis, Prevention and Treatment, 6th Edition*. Wiley-Blackwell publishers.
5. Trent, R. J. (2010). *Molecular Medicine, Fourth Edition: Genomics to Personalized Healthcare*. Academic Press.
6. Trent, R. J. (2005). *Molecular Medicine: An Introductory Text*. Academic Press.
7. Elles, R. and Mountford, R. (2012). *Molecular Diagnosis of Genetic Diseases Series: Methods in Molecular Medicine*.
8. Coleman, W. B. and Tsongalis, G. J. (2009). Molecular Pathology: The Molecular Basis of Human Disease. Academic Press.
9. Nussbaum, R.L., McInnes, R. Mc., Willard, H.F. (2009). *Genetics in Medicine*. Elsevier Inc., Philadelphia.
10. Read A and Donnai D (2007). *New clinical Genetics*. Scion Publishing Lmt., Oxfordshire, UK.

Related Weblinks

http://www.journals.elsevier.com/bba-molecular-basis-of-disease/
http://biology.gsu.edu/mbd/

LML.603: Bioinformatics and Computational Biology — Credit Hours: 4.

Learning Objective: Bioinformatics course is being offered to the students as fundamental course to brush up the basics of the students in this important emerging area. Students will be composed to the concepts of data mining, computational and algorithmic tools for biological data analysis and are expected to get a good idea on using computational resources to understand and resolve biological problems.

Unit: 1 — **18 Lectures**

Biological data: Types of biological data (various omics) Biological Databases Nucleic acid and protein sequence and protein structure databases Overview of available Bioinformatics resources on the web

Unit: 2 — **18Lectures**

DNA Sequence Analysis: Sequence annotation and sequence analysis Phylogeny of gene (blast, fasta, HMMer) and residue conservation. Primer design and Tm Calculation, DNA Restriction pattern analysis.Condon bias and its effect on the protein expression with reference to various expression system.

Unit: 3 — **18Lectures**

BioinformaticTools: Protein sequence and structure insights (PSSI) X-ray, NMR, Comparative modeling, ab initio, threading methods. Structure refining techniques Energy minimization approaches (Steepest descent, Conjugate gradient etc.), Basis of Molecular dynamics simulations and its application.

Unit: 4 — **18 Lectures**

Simulation Methods: algorithm for time dependence; leapfrog algorithm, Verlet algorithm, Boltzmann velocity, time steps, duration of the MD run, Starting structure, analysis of MD job, uses in drug designing, ligand protein interactions. Various methods of MD, Monte Carlo, systematic and random search methods. Differences between MD and MC, Energy, Pressure, Temperature, Temperature dynamics, simulation softwares.Various methods of MD, Monte Carlo, systematic and random search methods.

Suggested Reading:

1. Andrew R.Leach *Molecular Modelling Principles and applications* . (2001) II ed . Prentice Hall.
2. A.D. Baxevanis*et. al.*, *Current Protocols in Bioinformatics*, (2005) Wiley Publishers
3. David W.Mount *Bioinformatics* (2001) Cold Spring Harbor Laboratory Press, ISBN 0-87969-608-7
4. *Computational Molecular Biology* by P. A. Pevzner, Prentice Hall of India Ltd, (2004) ISBN81-203-2550-

8
5. D.E.Krane and M.L.Raymer *Fundamental concepts of Bioinformatics* (2003) Pearson Education ISBN 81-297-0044-1
6. N.Gautham *Bioinformatics* Narosa publications. (2006) ISBN-13: 9781842653005
7. Fenniri, H. "*Combinatorial Chemistry – A practical approach*",(2000) Oxford University Press, UK.
8. Lednicer, D. "*Strategies for Organic Drug Discovery Synthesis and Design*"; (1998) Wiley International Publishers.
9. Gordon, E.M. and Kerwin, J.F "*Combinatorial chemistry and molecular diversity in drug discovery*" (1998) Wiley-Liss Publishers.

LMD.600: Dissertation. **Credit Hours: 8**

Learning Objective: The objective of dissertation part I would be to ensure that the student learns the nuances of the scientific writing. Herein the student shall have to write his synopsis including an extensive review of literature with simultaneous identification of scientifically sound (and achievable) objectives backed by a comprehensive and detailed methodology.

The Evaluation criteria shall be multifacted as detailed below: **Total marks 200**

S.No.	Criteria	Marks allotted
1.	Review of literature:	50
2.	Identification of gaps in knowledge:	20
3.	Objective formulation:	50
4.	Methodology	50
5.	References	30

The synopsis shall be evaluated by a three membered committee consisting of
a. COC of the department
b. Supervisor or Co-supervisor
c. One faculty of allied department

Elective Course-III **Credit Hours: 3.**

Students has to choose 1 out of 2 elective course

LML.604: Evolutionary and Developmental Biology. **Credit Hours: 3.**

Learning Objective: This course is an introduction to animal evolution and development. The principal objective is to introduce students tothe origin of life and developmental processes that lead to the establishment of the body plan of vertebrates and the correspondingcellular and genetic mechanisms. This will allow students, at a later stage, to understand organogenesis and histogenesis, as well as pathology related to mechanisms of development and differentiation.

Unit 15 lectures

Origin of Life: Lamarckism, Darwinism, Concepts of variation, adaptation, struggle, Mendelism, Spontaneity of mutations, Theories of phyletic gradualism vs. punctuated equilibria, Modern evolutionary synthesis. Origin of basic biological molecules, Abiotic synthesis of organic monomers and polymers, Concept of Oparin and Haldane

Experiment of Miller (1953), The first cell, Evolution of prokaryotes, Origin of eukaryotic cells, Evolution of unicellular eukaryotes, Anaerobic metabolism, Photosynthesis and aerobic metabolism.

Unit: 2 **14 Lectures**

Paleontology and Molecular Evolution: The evolutionary time scale, Eras, periods and epoch, Major events in the evolutionary time scale, Origins of unicellular and multicellular organisms, Stages in primate evolution including *Homo sapiens*. Concepts of neutral evolution, Molecular divergence and molecular clocks, Molecular tools in phylogeny, Classification and identification; Origin of new genes and proteins; Gene duplication and divergence.

Unit: 3 **14 Lectures**

Basic Concepts of Development: Totipotency, Commitment, Specification, Induction, Competence, Determination and Differentiation, Morphogenetic gradients, Cell fate and cell lineages, Stem cells, Genomic equivalence and the cytoplasmic determinants, Imprinting, Mutants and transgenics in analysis of development.

Unit: 4 **10 Lectures**

Gametogenesis, Fertilization and Cell death: Production of gametes, Cell surface molecules in sperm-egg recognition in animals; Embryo-sac development and double fertilization in plants, Zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals, Embryogenesis and establishment of symmetry in plants, Seed formation. Hypersensitive response, functions, relevance with diseases, apoptosis, Caspases, Importance of PCD in plant development, role of PCD, model of PCD.

Suggested Reading:

1. Darwin, C.R. (1911). *On the origin of species by means of natural Selection, or preservation of favoured races in the struggle for life*.Hurst Publishers, UK.
2. Dawkins, R. (1996). *The Blind Watchmaker*, W.W. Norton & Company Jones and Bartlett Publishers.
3. Futuyma, D.J. (2009). *Evolution*. Sinauer Associates Inc. USA.
4. Hake, S. and Wilt, F. (2003). *Principles of Developmental Biology*.W.W. Norton & Company, New York, USA.
5. Hall, B.K. and Hallgrimsson, B. (2007). *Strickberger's Evolution*.Jones and Bartlett Publishers, India.
6. Lewin, R. (2004). *Human Evolution - An Illustrated Introduction*.Wiley-Blackwell, USA.
7. Scott, F. and Gilbert, S.F. (2010). *Developmental Biology*. Sinauer Associates, Inc. USA.
8. Slack, J.M.W. (2005) *Essential Developmental Biology*, Wiley-Blackwell, USA.

HGL:604:Genetic Diseases and Therapies **Credit Hours: 3.**

Learning Objective:Course Objectives: The students will become familiar with the various types of genetic disorders and the therapies which although are in the research stage but may emerge as a future treatment method.

Unit 1 **9 Lectures**

Monogenic Disorders: Albinism, Cystic fibrosis, Achondroplasia, Huntington disease, Muscular dystrophy,X-linked rickets

Multifactorial Diseases in man: Diabetes, Celiac disease, Liver cirrhosis, Obesity, Hypertension, Cancer as genetic disease, Cancer-prone syndromes.

Unit: 2 **18 Lectures**

Genomic Imprinting and Human Diseases: Uniparental Disomy & Genomic Imprinting Prader-Willi & Angelman syndromes, Beckwith-Wiedeman syndrome & Silver Russell Syndrome; Imprinting and brain and behaviour; Imprinting and Cancer.

Neurofibromatosis I; X/Y linked Human Syndromes due to Numerical Chromosomal Anomalies

Unit: 3 **18 Lectures**

Genetic Screening: Risk calculations, Population screening for genetic disease-adult, Clinical utilization of presymptomatic and predispositional testing, Presymptomatic testing for genetic diseases and malignancy, carrier detection; prenatal and postnatal screening; Assisted reproductive techniques and Pre-implantation diagnosis and Genetic Counseling

Unit: 4 9 Lectures

Therapies for genetic disorders and Multifactorial diseases: Stem Cell Therapies: Stem cell types, cord blood cells, bone marrow transplantation, current stem cell therapies, Gene Therapies, Problems in gene therapy,Chemo and Radio therapies;-Techniques in tissue engineering: tissue grafting, synthetic blood, skin grafts and metallic implants.

Suggested Reading:

1. Brown, S.M., (2009). *Essentials of Medical Genomics*. Wiley-Blackwell.
2. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009), *Lewin's Gene X*. Jones &Barlett.
3. Krebs, J.E., Goldstein, E.S. and Kilpatrick, S.T. (2014). *Lewin's Genes XI*. Jones and Bartlet India Pvt. Ltd.

Elective Course-IV **Credit Hours: 4.**

Students has to choose 1 out of 2 elective course

LML.605: Radiation Biology **Credit Hours: 4.**

Learning Objective: From this course the students would have fair knowledge of basic concepts of radiation biology such as radiation physics, radiation biology and radiological protection. the students will also learn the applications of radiations and radio diagnosis/therapeutics.

Unit: 1 20 Lectures

Basics of Radiation Biology: Types of radiation, characteristics and biological effects of ionizing radiations, types of radiation emitters and their interaction with matter, linear energy transfer and relative biologic effectiveness. Radioisotopes and stable isotopes.Radiation protection, maximum permissible dose (MPD).Radiation dosimetry, personnel monitoring, use of various radiation survey meters, film badges and room contamination monitors. Radiation hazard evaluation and control; control of external and internal exposure. Natural and man-made radiation exposures, major radiation accidents and environmental radiation exposure.

Radiation Safety and Regulation: Storage and handling of radioactive sources, safe work practice and decontamination. Radiation protection measures in industrial establishment, radioisotope labs, diagnostic/therapeutic installation and during transportation of radioactive substances, disposal of radioactive waste, administrative & legislative aspect of radiation protection

Unit: 2 18 Lectures

The oxygen Effect: Chemistry and biology of reactive oxygen species (ROS), oxidative stress and free radicals their role in cell metabolism, effects on marco/micromocules (proteins, lipids and DNA) and diseases (diabetes, neurodegenerative diseases, inflammation and cardiovascular disorders). Antioxidant defence system.

Radiation and Cell Signalling: Extracellular mediators and enzymes involved in radiation-induced bystander effects (RIBE) and their role in signalling, intracellular pathways and apoptotic and cell cycle regulatory factors (p53, p21, p34, and MDM2). Correlation between membrane integrated channels and mitochondrial functions with radiation-induced bystander effects. Radiation immunology: immunity response, radiation as immunosuppressive agent.

Unit: 3 18 Lectures

Acute Radiation Effects: Concept of LD_{50}, central nervous system syndrome, gastro-intestinal syndrome, bone marrow syndrome and skin reactions. **Chronic effects of radiations:** Early and delayed effects of radiation

exposure, cataractogenesis and carcinogenesis.Hereditary effects of radiation: chromosomal and chromatid aberrations, mutations in growth promoting proteins, mutations causing loss of growth-inhibition and cell cycle control.

Unit: 4 **16 Lectures**

Diagnostic Radiology: Sources of radiation, doses and their risk in diagnostic radiology. Interventional radiology and nuclear medicine. Molecular techniques in radiobiology and gene therapy. Radiations in tumour therapy: theoretical basis for radiation and chemotherapy interactions. Experimental chemotherapy and drug resistance. Radio-sensitizers, radio-protectors and bio-reductive drugs.

Suggested Reading:

1. Forshier, S. (2008) *Essentials of Radiation, Biology and Protection*,Cengage Learning, USA.Cengage.
2. Hall, E. J. and Giaccia, A. (2011). *Radiobiology for the Radiologist*, Lippincott Williams & Wilkins, US A.
3. Knoll, *G. F. (2010) Radiation Detection and Measurement*, Wiley, John & Sons, USA.
4. Martin, A., Harbison, S., Beach, K. and Cole, C. (2012) *An Introduction to Radiation Protection*, Hodder Arnold Publishers, UK.
5. Prasad, K. N. (2009). Bio-Shield, *Antioxidants against Radiological, Chemical and Biological Weapons*, Strategic Book Publishing, USA.
6. Washington, C. M. and Leaver D. T. (2009). *Principles and Practice of Radiation Therapy*, Elsevier Health Sciences, USA.

Related Weblinks:

http://informahealthcare.com/loi/rab
http://www.rob.ox.ac.uk/

HGL.607: Aging, Longevity and Health — Credit Hours: 4.

Learning Objective: From the course students should be able to understand the known mechanisms behind process of ageing and how diet, genetics and environmental factors affect the process of ageing.

Unit: 1 **9 Lectures**

Basic Concept &Theories of Aging: Overview and symptoms of aging, model organisms, Theories of aging-Genetic (Genetic control, Hayflick limit, DNA damage, error and repair, accumulated mutation, gene mutation, telomerase, antagonistic pleiotropy and redundant DNA theories), Non-genetic (Wear and tear, waste accumulation, cross-linkage, free-radical, order to disorder and disposable soma) and Physiological theories (Immunological, neuroendocrine, death hormone (DECO), thymic-stimulating, rate of living and calorie restriction theories).

Unit: 2 **18 Lectures**

Factors influencing Aging: DNA damage and repair, cellular senescence and apoptosis, sirtuins and deacetylases, hormones, glycation, protein damage, attenuated immunity, inflammation, accumulation of toxins and garbage in aging,

Unit: 3 **18 Lectures**

Molecular Mechanism of Aging: Mechanisms affecting aging due to calorie restriction, insulin signalling, mitochondria and telomerase. Longevity genes and biomarkers of aging, Cancer and aging.

Unit: 4 **9 Lectures**

Age associated diseases and Healthy Aging: Atherosclerosis and cardiovascular disease, cancer, arthritis, cataracts, osteoporosis, type 2 diabetes, hypertension and Alzheimer's disease. Conceptof healthy aging.

Suggested Readings:

1. Edward J. Masoro and Steven N. Austad (2011). *Handbook of the Biology of Aging*. 7th Edition. Academic Press, USA.

2. Jan Vijg (2007). *Aging of the Genome: The Dual Role of DNA in Life and Death*. 1st Edition. Oxford University Press, UK.
3. Surish Rattan (2003).*Modulating Aging and Longevity* (Biology of Aging and its Modulation). Springer, USA.
4. Thomas von Zglinicki (2003). *Aging at the Molecular Level*. Springer Science & Business Media, USA.
5. A Macieira-Coelho (2003). *Biology of Aging*. I[st] edition. Springer Verlag Berlin Heidelberg, New York.

Semester IV							
S.No	Paper Code	Course Title	Course Type	L	T	P	Cr
1	LML.621	Genetic Engineering and Recombinant Therapeutics	C	4	-	-	4
2	LML.622	Clinical and Medical Diagnostics	C	4	-	-	4
3	LMD.600	Dissertation				32	16
				6	0	32	24

LML.621: Genetic Engineering and Recombinant Therapeutics. **Credit Hours: 4.**

Learning Objective: This course will introduce modern techniques for genetic engineering and students will learn cutting edge molecular engineering. Course will start with the basics of genetic engineering, the methodology of gene manipulation, and the implications of genetic engineering.

Unit: 1 **16 Lectures**

Basics of Genetic Engineering: Gene Manipulation, Tools for molecular cloning.Restriction enzymes their types, Type I, II and III, restriction modification systems, Cohesive and blunt and ligation, linkers, adaptors, homopolymeric tailing, transformation, transfection: chemical and physical methods, sequencing and clone confirmation, expression opimization, *in-silico* methods of design.

Unit: 2 **16 Lectures**

Gene Cloning Vectors: Plasmids, bacteriophages, cloning in M13 mp Vectors, phagemids, Lamda vectors; insertion and replacement vectors, EMBL, λ DASH, λ gt10/11, λZAP etc. Cosmid vectors.

Unit: 3. **20 Lectures**

Expression Vectors: Artificial chromosome vectors (YACs, BACs), Animal virus derived vectors-Sv-40, caccinal/bacculo& retroviral vectors. Expression vectors;pMal, GST, PET – based vectors. Protein purification; His-tag, GST-tag, MBP-tag.Restriction proteases, intein-based vectors. Inclusion bodies methodologies to reduce formation of inclusion bodies, *baculovirus* and pichia vectors system.Site Directed Mutagenesis.

Unit: 4 **20 Lectures**

Techniques and Applications of recombinant DNA technology: Isolation and Detection of DNA, RNA and proteins by Southern blotting, Northern blotting, Western blotting and *in situ* hybridization techniques. Sites specific mutagenesis: Yeast two hybrid system, phage display, characterization of expressed proteins through various biophysical, biochemical methods. Gene mapping and Microarrays. Genetically modified microbes (Recombinant

bacteria) for the production of commercial scale production of proteins and pharmaceuticals, antibiotics, enzymes, insulin, growth hormones, monoclonal antibodies. Applications rDNA in diagnosis of pathogens and abnormal genes. Transgenic animals. Transgenic animals for production of proteins and pharmaceuticals. Genetically modified insect cells for the production of commercially important bioproducts.Biosafety and Ethical considerations in rDNA and genetic engineering.

Suggested Reading:

1. R.W. Old & S.B. Primrose (2007) *Principles of Gene Manipulation* 7th Edition Blackwell science.
2. Bernard R. Glick & Jack J. Pasternak. (2010) *Molecular Biotechnology* 4th Edition ASM Press Washington.
3. James, Watson Micheal Gilman Jan Witkowsk (2007) *Recombinant DNA* 3rd edition . CSHL, New York.
4. CokinRateldge and Bjorn Christiansen, (2006) *Basic Biotechnology* 3rd Edition Cambridge University press.
5. John E. Smith. (2009) *Biotechnology* 5th Edition by Cambridge University press.
6. *Molecular Biology* of Gene 6th Edition by Watson CSHL Press New York.
7. Sambrook& Russell *Molecular cloning* , CSHL Press, New York.
8. David &Freifelder John &Barlett (2008) *Molecular biology* 2ndEdition ,Narosa publishing , New Delhi.

Related Weblinks:

1. http://www.genengnews.com/ontheweb.asp
2. http://www.ige-india.com/
3. http://www.icgeb.org/~bsafesrv/
4. http://www.livescience.com/32648-whats-genetic-engineering.html

LML.622: Clinical and Medical Diagnostics **Credit Hours: 4.**

Learning Objective: This course will help the student to understand the mechanisms of the origin and development of disease and its manifestations in the form of molecular, chemical, physiological and morphological changes. Student will able to integrate the clinical information with the underlying pathophysiology and will be able to correlate the disease symptoms and associated laboratory diagnosis

Unit: 1 **18 Lectures**

Bioethics and Biosafety in Research, Clinical studies and Medicine: Good laboratory practices, Biological Containment (BC) and Physical Containment (PC), CDC Biosafety levels, Biosafety in Clinical Laboratories and Biohazard Management.Biosafetyfor human Health, Biosafety issues for using cloned genes, Genetically Engineered Organisms and r-DNA based products.

Bioethicsin Research, Animal Testing. Animal Rights, Perspectives and Methodology. Ethical Issues of the Human Genome Project, Code of Ethics in Medical/clinical laboratories. Healthcare rationing, Ethical Issues of Xenotransplantation, Ethics involved in Embryonic and Adult Stem Cell Research, Ethics in Assisted Reproductive Technologies: animal and human cloning and *In-vitro* fertilization, the element of Informed Consent, Ethical issues in MTP and Euthanasia

Unit: 2 **18 Lectures**

Clinical Pathology and Medical Diagnostics: Analyses of body fluids and tissues and from various disciplines of microbiology, serology, clinical chemistry, hematology, transfusion medicine, cytogenetics.

Importance of diagnostic tools, Instruments used in medical diagnostics, imaging techniques.

Unit: 3 **18 Lectures**

Clinical Laboratory Sciences: Urine analysis to measure general health, collection methods, physical Examination of Urine, chemical Examination of Urine, microscopic Examination of Urine, blood, glucose or protein detection in

urine, disease association. Blood group and Rh factor, Clinical correlation of RBC and WBC counts, Platelets and Health, Blood clotting disorders, Blood cancers. Histopathology: Grossing of tissue, tissue processing, fixation of tissue, section cutting, staining techniques, Hematoxylin and Eosin and Special Stains, Immunohistochemistry and immunofluorescence techniques.

Unit: 4 **18 Lectures**

Gene Therapy in HumanDiseases. Vectors used in gene therapy Biological vectors – retrovirus, adenoviruses, Herpes Synthetic vectors– liposomes, receptor mediated gene transfer. Gene therapy trials – Familial Hypercholesterolemia, Cystic Fibrosis, Solid tumors. Cell and tissue engineering: Stem cell Potential use of stem cells – Cell based therapies, Nanomedicine. **Chromosomal disorders**: autosomal; sex chromosomal; karyotype analysis, G-banding, in situ hybridization (FISH and on-FISH), and comparative genomic hybridization (CGH).Cancer cytogenetics: spectral karyotyping, DNA diagnostics: PCR based diagnostics; ligation chain reaction, southern blot, diagnostics, array-based diagnostics, DNA sequencing, genetic profiling, single nucleotide polymorphism.

Suggested Reading:

1. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009), *Lewin's Gene X*. Jones &Barlett.
2. Milunsky, A.,Milunsky, J. (2009). *Genetic Disorders and the Fetus: Diagnosis, Prevention and Treatment, 6th Edition*. Wiley-Blackwell publishers.
3. Patch, H. S. C. (2009). *Genetics for the Health Sciences*. Scion Publishing Ltd., UK.
4. Brown, S. M., (2009). *Essentials of Medical Genomics*. Wiley-Blackwell.
5. Lodish, H., Berk, A., Chris, A. K., Krieger, M. (2008), *Molecular Cell Biology*. W.H. Freeman, USA.
6. Kingston H (2002) *ABC of Clinical Genetics*. Blackwell BMJ books, 3rd edition.
7. McPherson and Pincus. *Henry's Clinical Diagnosis and Management* by Laboratory Methods. 22nd edition. Saunders Publishing Company

Related Weblinks:

1. http://csu-cvmbs.colostate.edu/vth/diagnostic-and-support/clinical-pathology/Pages/default.aspx
2. http://www.hopkinsmedicine.org/healthlibrary/conditions/pathology/clinical_pathology_overview_85,P00955
3. http://www.biomedcentral.com/bmcclinpathol
4. http://www.genome.gov/11508982

LMD.600: Dissertation **Credit Hours: 16.**

Learning Objective: The objective of dissertation part II would be to ensure that the student learns the nuances of the scientific research. Herein the student shall have to carry out the experiments to achieve the objectives as mentioned in the synopsis. The data collected as a result of experiments must be meticulously analysed in light of established scientific knowledge to arrive at cogent conclusions.

The Evaluation criteria shall be multifacted as detailed below:

Total marks 400

S.No.	Criteria	Marks allotted
1.	Report Writing	125
2.	Presentation and open defence of research work	125
3.	Continuous evaluation of student by Guide	150

The synopsis shall be evaluated by a three membered committee consisting of

a. COC of the department
b. External Expert
c. Supervisor (and Co-supervisor if applicable)

Central University of Punjab, Bathinda

Centre For Human Genetics and Molecular Medicine

M.Sc. Life Sciences Specialization in Molecular Medicine

M.Sc. Life Sciences Specialization in Molecular Medicine

Semester-1

S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				
							A	B	C	D	E
1	LMM.501	Research Methodology	2			2	25	25	25	25	50
2	LMM.502	Biostatistics	2	-	-	2	25	25	25	25	50
3	LMM.504	Cell Biology	3	-	-	3	25	25	25	25	75
4	LMM.506	Biochemistry	3	-	-	3	25	25	25	25	75
5	LMM.508	Genetics	3			3	25	25	25	25	75
6	LMM.510	Concepts and Prospects in Molecular Medicine	4	-	-	4	25	25	25	25	100
7	*	Inter-Disciplinary Elective -1 (From Other Departments)	2	-	-	2	25	25	25	25	50
8	LMM.503	Biostatistics (P)	-	-	2	1	-	-	-	-	25
9	LMM.505	Cell Biology (P)	-	-	2	1	-	-	-	-	25
10	LMM.507	Biochemistry (P)	-	-	2	1	-	-	-	-	25
11	LMM.509	Genetics (P)	-	-	2	1	-	-	-	-	25
12	LMM.500	Credit Seminar			2	1	-	-	-	-	25
		Total Sem-1	19	0	10	24					600

A: Continuous Assessment: Based on Objective Type Tests
B: Pre-Scheduled Test-1: Based on Objective Type & Subjective Type Test (By Enlarged Subjective Type)
C: Pre-Scheduled Test-2: Based on Objective Type & Subjective Type Test (By Enlarged Subjective Type)
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

ID courses offered by HGMM faculty in semester-I

S.No.	Code	Course title (offered by)	Credits
1	LMM. 540	Basics of Stem Cell Biology (Dr. Sandeep Singh)	2
2	LMM. 541	Introduction to Immune system (Dr. MonishaDhiman)	2
3	LMM. 542	Introduction to Human Cancers (Dr. Harish Chander)	2

LMM.501: Research Methodology. **Credit Hours: 2.**

Unit 1 5 Lectures

General principles of research: Meaning and importance of research, critical thinking, formulating hypothesis and development of research plan, review of literature, interpretation of results and discussion.

Unit 2 10 Lectures

Technical writing: Scientific writing that includes the way of writing Synopsis, research paper, poster preparation and presentation, and dissertation.

Unit 3 5 Lectures

Library: Classification systems, e-Library, web-based literature search engines

Unit 4 16 Lectures

Entrepreneurship and business development: Importance of entrepreneurship and its relevance in career growth characteristics of entrepreneurs, developing entrepreneurial competencies, types of enterprises and ownership (Large, medium SSI, tiny and cottage industries, limited, public limited, private limited, partnership, sole proprietorship) employment, self-employment and entrepreneurship, financial management-importance and techniques, financial statements- importance and its interpretation, and Intellectual Property Rights (IPRs).

Suggested Reading:

1. Gupta, S. (2005). *Research methodology and statistical techniques.* Deep & Deep Publications (p) Ltd. New Delhi.
2. Kothari, C.R. (2008). *Research methodology (s).* New Age International (p) Limited. New Delhi.
3. Standard /Reputed Journal authors' instructions.

LMM.502: Biostatistics. **Credits Hours: 2.**

Unit 1 6 Lectures

Overview of Biostatistics: Difference between parametric and non-parametric statistics, Univariant and multivariant analysis, Confidence interval, Errors, Levels of significance, Hypothesis testing.

Unit 2 8 Lectures

Descriptive statistics: Measures of central tendency and dispersal, Histograms, Probability distributions (Binomial, Poisson and Normal), Sampling distribution, Kurtosis and Skewness.

Unit 3 8 Lectures

Experimental design and analysis: Sampling techniques, Sampling theory, Various steps in sampling, collection of data-types and methods.

Unit 4 14 Lectures

Inferential Statistics: Student's t-test, Paired t-test, Mann-Whitney U-test, Wilcoxon signed-rank, One-way and two-way analysis of variance (ANOVA), Critical difference (CD), Least Significant Difference (LSD), Kruskal–Wallis one-way ANOVA by ranks, Friedman two-way ANOVA by ranks, χ^2 test. Standard errors of regression coefficients, Comparing two regression lines, Pearson Product-Moment Correlation Coefficient, Spearman Rank Correlation Coefficient, Power and sampling size in correlation and regression.

Suggested Reading:

1. Gookin, D. (2007). *MS Word 2007 for Dummies.* Wiley, USA.
2. Harvey, G. (2007). *MS Excel 2007 for Dummies.* Wiley, USA.
3. Johnson, S. (2009). *Windows 7 on demand.* Perspiration Inc. USA.
4. Norman, G. and Streiner, D. (2008). *Biostatistics: The Bare Essentials.* 3/e (with SPSS). Decker Inc. USA.
5. Sokal, R.R. and Rohlf, F.J. (1994). *Biometry: The Principles and Practices of Statistics in Biological Research.* W.H. Freeman publishers, USA.
6. Thurrott, P. and Rivera, R. (2009). *Windows 7 Secrets.* Wiley, USA.

LMM.504: Cell Biology. **Credit Hours: 3.**

Unit 1 15 Lectures

Introduction to the cell: Evolution of the cell, From molecules to first cell, From prokaryotes to eukaryotes, Prokaryotic and eukaryotic genomes, Single cell to multicellular organisms.

Membrane structure and function: Models of membrane structure, Membrane proteins, Membrane carbohydrates, Membrane transport of small molecules, Membrane transport of macromolecules and particles. Structural organization and function of intracellular organelles: The lysosomes, Ribosomes, The peroxisomes, The golgi apparatus, The endoplasmic reticulum, Mitochondria and chloroplast, Structure of mitochondria and chloroplast, Oxidation of glucose and fatty acids, Electron transport oxidative phosphorylation, Chloroplast and photosynthesis.

Unit 2 12 Lectures

Protein secretion and sorting: Organelle biogenesis and protein secretion, synthesis and targeting of mitochondria, chloroplast, peroxisomal proteins, translational modification in the ER. Intracellular traffic, vesicular traffic in the secretary pathway, protein sorting in the Golgi bodies, traffic in the endocytic pathway, exocytosis.

Unit 3 **15 Lectures**

The cytoskeleton: The nature of cytoskeleton, Intermediate filaments, Microtubules, Actin filaments, Cilia and centrioles, Organization of the cytoskeleton. **Cell communication and cell signaling:** Cell adhesions, Cell junctions and the extra cellular matrix, Cell-cell adhesion and communication, Cell matrix adhesion, Collagen the fibrous protein of the matrix, Non-collagen component of the extra cellular matrix.

Unit 4 **12 Lectures**

Cell growth and division: Overview of the cell cycle and its control, The molecular mechanisms for regulating mitotic and meiotic events, Amitosis, Cell cycle control, Checkpoints in cell cycle regulation. Cell to cell signaling, Overview of the extra cellular signaling, Identification of cell surface receptors, G-protein coupled receptors and their effectors, Second messengers, Enzyme-linked cell surface receptors, Interaction and regulation of signaling pathways.

Suggested Reading:

1. Alberts, B., Bray, D., Lews, J., Raff, M., Roberts, K. and Watson, J.D. (2010). *Molecular Biology of the cell*. Garland publishers, Oxford.
2. Celis, J.E. (2006). *Cell biology: A laboratory handbook*, Vol 1, 2, 3. Academic Press, UK.
3. Gupta, P.K. (2008). *Cytology, Genetics and Evolution*. Rastogi publications, Meerut, India.
4. Karp, G. (2010). *Cell and Molecular Biology: Concepts and Experiments*. John Wiley & Sons. Inc. New Delhi, India.

LMM.506: Biochemistry. **Credits Hours: 3.**

Unit 1 **12 Lectures**

Principles of biophysical chemistry pH, Buffer, Reaction kinetics, Thermodynamics, Colligative properties, Structure of atoms, Molecules and chemical bonds. Stabilizing interactions: Van der Waals, Electrostatic, Hydrogen bonding, Hydrophobic interaction, etc.

Unit 2 **15 Lectures**

Composition, Structure and Function of Biomolecules: Carbohydrates, Lipids, Proteins, Nucleic acids and Vitamins. Bioenergetics and metabolism of Carbohydrates, Lipids, Amino Acids and Nucleotides.

Unit 3 **15 Lectures**

Enzymology: Classification, Principles of catalysis, Mechanism of enzyme catalysis, Enzyme kinetics, Enzyme regulation, Isozymes Clinically important enzymes.

Unit 4 **12 Lectures**

Protein Chemistry: Ramachandran plot, Secondary, Tertiary and Quaternary structure, Domains, Motif and Folds. Nucleic acids: A-, B-, Z-DNA, tRNA, micro-RNA, Stability of protein and Nucleic acid structures.

Suggested Reading:

1. Berg, J.M., Tymoczko, J.L. and Stryer, L. (2010). *Biochemistry*. W.H. Freeman & Company. USA.
2. Brown, T.A. (2006). *Gene Cloning and DNA analysis: In Introduction*. Blackwell Publishing Professional. USA.
3. Haynie, D.T. (2007). *Biological thermodynamics*. Cambridge University. UK.
4. Mathews, C.K., Van Holde, K.E. and Ahern, K.G. (2000). *Biochemistry*.Oxford University Press inc. New York.
5. Nelson, D. and Cox, M.M. (2008). *Lehninger Principles of Biochemistry*. BI publications Pvt. Ltd. Chennai, India.
6. Ochiai, E. (2008). *Bioinorganic chemistry: A survey*. Academic Press. Elsevier, India.

7. Randall, D. J., Burggren, W. and French, K. (2001). *Eckert animal physiology*. W.H. Freeman & Company. USA.
8. Raven, P.H., Johnson, G.B. and Mason, K.A. (2007). *Biology*. Mcgraw-Hill. USA.
9. Shukla AN (2009). *Elements of enzymology*. Discovery Publishing. New Delhi, India.
10. Voet, D. and Voet, J.G. (2008). *Principles of biochemistry*. CBS Publishers &_Distributors. New Delhi, India.

LMM.508: Genetics. **Credits Hours: 3.**

Unit 1 **14 Lectures**

Introduction and Scope of Genetics, DNA as genetic material: The vehicles of inheritance, Chemical structure and base composition of nucleic acids, Double helical structure, Structure of DNA and RNA, Different types of DNA molecules, forces stabilizing nucleic acid structure, super coiled DNA, properties of DNA, denaturation and renaturation of DNA and Cot curves. **DNA replication:** Messelson and Stahl Experiment, Carins Experiment, Okazaki Experiment, Basic mechanism of DNA replication.

Unit 2 **12 Lectures**

Cell division and Cell cycle: Mitosis, Meiosis, Chromosomal basis of inheritance. Basic principles of Mendelian inheritance: Segregation and independent assortment, Alleles and multiple alleles, Human pedigrees and inheritance.Linkage analysis and gene mapping: Coupling and repulsion phase linkage, Crossing over and recombination. Population genetics: Application of Mendel's laws to populations, Hardy-Weinberg principle, inbreeding depression and heterosis, inheritance of quantitative traits.

Unit 3 **14 Lectures**

Gene Interaction: Sex determination and Sex linked inheritance, Sex determination in humans, *Drosophila* and other animals, Sex determination in plants, Sexlinked genes and dosage compensation. Human genetics: pedigree analysis. Gene concept: Fine structure of gene and gene concept, Fine structure analysis – Benzer's experiments, Complementation analysis and fine structure of gene, Complementation and recombination, Concept of gene.

Unit 4 **14 Lectures**

Extra-chromosomal Inheritance: Chloroplast and Mitochondrial inheritance, Yeast, *Chlamydomonas/Neurospora*and higher plants_Chromosomal aberrations: Types of changes– deletions, duplications, inversions, translocations,Change in chromosome number: trisomy and polyploidy. Evolutionary history of bread wheat, Aneuploids–nullisomics, monosomics, and trisomics, Somatic aneuploids, Changes in chromosome structure, Properties of chromosomes for detection of structural changes.Mutations: Spontaneous and induced mutations, Somatic vs germinal mutation.

Suggested Reading:

1. Anthony, J.F., Miller, J.A. ,Suzuki, D.T., Richard, R.C., Gilbert, W.M. (1998). *An introduction to Genetic Analysis*. W.H. Freeman publication, USA.
2. Atherly, A.G., Girton, J.R., Mcdonald, J.F. (1999).*The Science of Genetics*.Saundern College publication.
3. Snusted, D.P., Simmons, M. J. (2010). *Principles of Genetics*. John Wiley & Sons, New York.
4. Gupta, P.K. (2009). *Genetics*. Rastogi publications, Meerut, India.
5. Gupta, P.K (2008). *Cytology, Genetics and Evolution*.Rastogi publications, Meerut, India.
6. Jocelyn, E.K., Elliott, S.G., Stephen, T.K. (2009).*Lewin's Genes X*. Jones & Bartlett Publishers, USA.
7. Schaum, W.D. (2000). *Theory andProblems in Genetics by* Stansfield, outline series McGrahill, USA.
8. Tamarin, R.H. (1996). *Principles of Genetics. International edtn.*McGrawhill, USA.

LMM.510: Concepts and Prospects of Molecular Medicine. **Credits Hours: 4.**

Unit 1 **18 Lectures**

Molecular Basis of Diseases: Human genetics relevant to molecular medicine, single nucleotide polymorphisms, multiple gene polymorphisms, single and multi-gene diseases, gene-environment interactions in disease manifestation, genetic and physical mapping of human genome and identification of diseases gene.

Unit 2 **18 Lectures**

Molecular Medicine Therapeutics: Gene therapy and recombinant molecules in medicine and therapeutic development, Antiviral therapies, vehicles for gene therapies, pharmacogenomics, its application and role in developing novel therapies. RNAi and human diseases, alternate splicing and human disease.

Unit3 **18 Lectures**

Signal Transduction and its role in Human Diseases: Cellular and tissue microenvironment in diseases, drug resistance with convention chemotherapies, construction of knock-out and transgenic animals, Protein as causes of human diseases.

Unit4 **18 Lectures**

Clinical trials, adjuvant therapies, monoclonal antibodies as drugs, nanobiotechnology and its applications in molecular medicine, next generation sequencing techniques. Stem cell research and its application in human health

Suggested Reading:

1. Littwack, G. (2008). *Human Biochemistry and Disease*. Academic Press.
2. Trent, R. J. (2012). *Molecular Medicine,* Fourth Edition: Genomics to Personalized Healthcare. Academic Press.
3. Trent, R. J. (2005). *Molecular Medicine: An Introductory Text*. Academic Press.
4. Elles, R., Mountfield, R. (2011). *Molecular Diagnosis of Genetic Diseases*. Springer Publication.
5. Licinio, J., Wong, M. L. (2003). *Pharmacogenomics: The Search for Individualized Therapies.* Wiley-VCH Verlag GmbH & Co. KGaA.
6. Audet, J.,Stanford, W.and Stanford,W. L. (2009) *Stem cells in regenerative medicine.* New York, Humana press.

LMM.503: Biostatistics - practical. Credit Hours: 1.

1. Experimental design and analysis.
2. Training on basic usage of Microsoft Word, Microsoft Excel, Microsoft PowerPoint and Internet Explorer.
3. Optimizing web search: Google advanced search, Boolean operators, Literature search using Google Scholar, HighWire.
4. Bibliography management and research paper formatting using reference software EndNote
5. Performing statistics analyses using MS Excel Analysis toolpack.
6. Creating a functional website using HTML.
7. Basic programming using DOS batch files and Auto Hot Key.

*More practicals may be added/modified from time to time depending on available facilities / faculties.

LMM.505: Cell Biology – Practical. Credit Hours: 1.

1. Preparation of mitotic & meiotic chromosomes.
2. Study of structure of cell organelles through electron micrographs.
3. Instrumental methods for cell biology-centrifugation, chromatography.
4. Bacterial staining and identification.
5. Sectioning of tissues (Plant and animal).
6. Histochemical techniques (Fixing, Processing, Staining).

*More practicals may be added/modified from time to time depending on available facilities / faculties.

LMM.507: Biochemistry – Practical. Credit Hours: 1.

1. Preparation of Solutions, buffers, pH setting etc.
2. Amino acid and carbohydrate separations by paper & thin layer chromatography.
3. Quantitative Estimation of Proteins, Sugars, total lipids and amino acids.
4. Assay and estimation of different enzymes e.g. invertase, amylases, acid and alkaline phosphatases in plant seeds.
5. Principle and application of electrophoresis. Native, SDS PAGE.
6. Estimation of total phenolic compounds.

7. Extraction and estimation of vitamins.

*More practicals may be added/modified from time to time depending on available faculties/facilities.

LMM.509: Genetics - Practical. Credit Hours: 1.

1. Calculation of allele frequencies.
2. Calculating recessive gene frequency, Calculating frequency of sex –linked alleles.
3. Karyotyping of normal & abnormal chromosome sets.
4. Monohybrid and dihybrid ratios, Multiple alleles, Epistasis – Problems.
5. Inheritance patterns in Man – Numericals on Pedigree analysis- Autosomal patterns, X–linked patterns, Y–linked patterns.
6. Mitochondrial inheritance patterns.
7. To test PTC tasting ability in a random sample and calculate gene frequencies for the taster and non–taster alleles.
8. Identification of inactivated X chromosome as Barr body and drumstick.
9. Blood group typing using haemagglutination tests.
10. Studies of a Model organism: Identification of normal and mutant flies (Drosophila melanogaster) & Preparation of Drosophila polytene chromosomes.
11. To study fingerball and palmar dermatogylphics and calculate indices.
12. To test for colour blindness using Ishihara charts.
13. Molecular Mapping of Genes.

*More practicals may be added/modified from time to time depending on available faculties/facilities.

LMM.500 Credit Seminar

Interdisciplinary Courses for Semester-I

(To be offered by faculties from other centres)

Course Code: Code shall be brought from the department whose course is undertaken by the student.

L	T	P	Credits	Marks
2	0	0	2	50

Course Objectives: To ensure holistic development of student's knowledge and perspective, a course from other department must be undertaken by the student. This course shall carry 2 credits and will be evaluated out of 50 Marks

Interdisciplinary Courses offered by Faculty of Genetic Diseases and Molecular Medicine

Course Title: Basics of Stem Cell Biology

Course Code: LMM. 540

L	T	P	Credits	Marks
2	0	0	2	50

Course Objectives: To instill awareness on the basics of cell biology and enable the student to understand the concept of stem cells and their importance for diverse disciplines

Unit: 1 7 Hours

Basics of cell biology: Introduction to cell, different types of cells, prokaryotic, eukaryotic, plant, animal, microbial cells, somatic and germline cell types,

Unit: 2 7 Hours

Cellular complexities: Evolution from single cell life to complex multicellular organisms, cell differentiation, cellular microenvironment, different types of human cells, cell signalling and its role in synchronized function of various tissues.

Unit: 3 7 Hours

Stem cells: Types of stem cells, pluripotent, multipotent stem cells and precursor cells, adult, fetal, cord blood and embryonic stem cells, induced pluripotent stem cells.

Unit: 4 7 Hours

Stem cells and therapeutics: Stem cells applications in treating various diseases like diabetes, RA, Parkinson's, Alzheimer's, Stroke and brain injury repair, Spinal cord injuries, anti-cancer, heart infarction, vision and hearing repair, teeth replacement, tissue replacements, skin grafting and wound healing.

Suggested Reading:

1. Alberts, B. Bray, D. Lews, J., Raff, M., Roberts, K. and Watson, J.D. (2010). Molecular Biology of the Cell. Garland publishers, Oxford.
2. Celis, J.E. (2006). Cell biology: A laboratory handbook, Vol 1, 2, 3. Academic Press, UK.
3. Karp, G. (2010). Cell and Molecular Biology: Concepts and Experiments. John Wiley & Sons. Inc., New Delhi, India
4. Alimoghaddam, K. (2013). Stem Cell Biology in Normal Life and Diseases. INTECH publications.
5. ***Lanza R., Gearhart,J., Hogan,B.,Melton,D., Pedersen, R., Thomas ,E.D., Thomson, J., Wilmut, I. (2013).*** Essentials of Stem Cell Biology (Second Edition).

Course Title: Introduction to Immune system

Course Code: LMM. 541

L	T	P	Credits	Marks
2	0	0	2	50

Course Objectives: To instill awareness on very basics of immune system where student will learn the components of the human immune response that work together to protect the host.

Unit: 1 7 Hours

Elements of Immune system: Cells, Organs, and microenvironments of the immune system. Innate and adaptive immunity, cellular and humoral immunity, inflammatory and regulatory networks and small biochemical mediators (cytokines).

Unit: 2 7 Hours

Function of immune system: Discriminate between self and non-self. A functional immune system confers a state of health through effective elimination of infectious agents (bacteria, viruses, fungi, and parasites) and through control of malignancies by protective immune surveillance.

Unit: 3 7 Hours

Immunodeficiency and dysfunction as the basis of disease: Immune Deficiencyand dysfunction diseases. Because specific mechanism affects prognosis as well as therapeutic approaches, Gel and Coombs classified these dysfunctional immune responses into hypersensitivitydiseases.

Unit: 4 7 Hours

Immunological Processes and Therapeutics

Suggested Reading:

1. Abbas. (2010). *Cellular and Molecular Immunology*. CBS Publishers & Distributors, India.
2. Charles, A. and Janeway, J. R. (1994). *Immunobiology: The Immune system in health and disease*. Blackwell Publishing, USA.
3. Delves, P. J., Roitt, I. M. and Seamus, J. M. (2011). *Roitt's Essential Immunology (Series- Essentials)*. Blackwell Publishers, USA.
4. Elgert, K. D. (2009). *Immunology: Understanding the immune system*. Wiley-Blackwell, USA.
5. Kindt, T. J., Osborne, B. A. and Goldsby, R. A. (2007). *Kuby Immunology* 7th Edition. W. H. Freeman, USA.
6. Sawhney, S. K. and Randhir, S. (2005). *Introductory practical biochemistry*. Alpha Science International Ltd. New Delhi, India.
7. Tizard. (2009). *Immunology: An Introduction*. Cengage Learning, Thompson, USA

Course Title: Introduction to Human Cancers

Course Code: LMM. 542

L	T	P	Credits	Marks
2	0	0	2	50

Course Objective: Introduction to human Cancers course is designed as an Interdisciplinary course to acquaint the students of different streams of Life Sciences with a basic knowledge and understanding about various cancers.

Unit I 15 hours

History, features of cancer including tumorigenesis and metastasis, Different types of cancers, symptoms of cancer, various methods for the detection of cancer, treatment of cancer, surgery and chemotherapy and targeted cancer therapy, bone marrow transplantation, institutes of national and international importance involved in cancer patient care and basic cancer research, application of new technologies in prevention, assessing risk, diagnosis and treatment. Tumor suppressors and oncogenes

Unit II 15 hours

Role of hormones and growth receptors as carcinogens in tumorigenesis and metastasis, environmental mutagens, occupational cancers, role of modern industry in carcinogenesis, effect of environmental pollutants on tumor suppressor genes, effect of cancer on the functioning of cell machinery, lifestyle changes, stress and cancer, importance of molecular biology in basic cancer research, socioeconomic impact of cancer.

Suggested Reading:

1. Ainley, R. (2010). *Cancer Chemotherapy: basics to clinic*. Willey-Blackwell publishing, New Jersey.
2. DeVita, V. T., Hellman, S., Rosenberg, S. A. (2011). *Cancer: principles and practice of oncology*. Lippincot Williams and Wilkins publishers, Philadelphia.
3. Enders, G. H. (2010). Cell *cycle deregulation in cancer*. Humana Press, Springer science, New York.
4. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009). *Lewin's Gene X*. Jones & Barlett.
5. Wang, E. (2010). *Cancer systems biology*. CRC press, Taylor & Francis group, New York.
6. Weinberg, Robert A. (2007). *The Biology of Cancer*. New York: Garland Science

Web links:

http://www.insidecancer.org/

http://www.cancer.gov/publications/patient-education

http://www.who.int/cancer/en/

http://www.cancer.org/

http://www.nci.nih.gov/cancertopics

Central University of Punjab, Bathinda

Centre For Human Genetics and Molecular Medicine

M.Sc. Life Sciences Specialization in Molecular Medicine

Semester 2											
S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				
							A	B	C	D	E
1	LMM.511	Human Physiology	3	-	-	3	25	25	25	25	75
2	LMM.513	Immunology	2	-	-	2	25	25	25	25	50
3	LMM.514	Regenerative medicine and Stem Cell Therapies	4			4	25	25	25	25	100
4	LMM.515	Molecular Biology	3			3	25	25	25	25	75
5	LMM.517	Techniques in Life Sciences	3			3	25	25	25	25	75
6	LMM.XXX	Elective Course-1	4			4	25	25	25	25	100
7		Interdisciplinary course-2	2			2	25	25	25	25	50
8	LMM.512	Human Physiology (P)	-	-	2	1	-	-	-	-	25
9	LMM.516	Molecular Biology (P)			2	1	-	-	-	-	25
10	LMM.599	Seminar			2	1	-	-	-	-	25
			19	0	6	24					600
Opt any one course from the following Elective courses											
14	LMM.551	Cancer Biology	4			4	25	25	25	25	100
15	LMM.552	Radiation Biology	4			4	25	25	25	25	100
16	LMM.553	Signal Transduction	4			4	25	25	25	25	100

A: Continuous Assessment: Based on Objective Type Tests
B: Pre-Scheduled Test-1: Based on Objective Type & Subjective Type Test (By Enlarged Subjective Type)
C: Pre-Scheduled Test-2: Based on Objective Type & Subjective Type Test (By Enlarged Subjective Type)
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

LMM.511: Human Physiology. **Credit Hours: 3.**

Unit: 1 **14 Lectures**

Muscle Physiology: Types of muscles, Properties; Contractile force; Motor Unit. Skeletal, cardiac and smooth Muscle Mechanics & Metabolism. Control of Body Movement.

Cardiovascular system: Comparative anatomy of heart structure, Myogenic heart, specialized tissue, Cardiac cycle, Heart as a pump, blood pressure, neural and chemical regulation of all above, Blood cell synthesis and Bone marrow, Haemopoiesis and formed elements, Plasma function, Blood volume and its regulation, Blood groups, Haemoglobin, Haemostasis.

Unit: 2 **12 Lectures**

Digestive system: Digestion, absorption, energy balance, BMR, Epithelial Barrier Function, Regulation of Swallowing and Gastric Emptying and Small/ Large Bowel. Gastro-intestinal Secretions and accessory glands

Respiratory system: Anatomical considerations, Transport of gases, Exchange of gases, Waste elimination, Neural and chemical regulation of respiration. Alveolar Ventilation, Diffusion Across Alveoli. Transport of Respiratory Gases in Blood. The Respiratory System Under Stress: Altitude, Hypoxia

Excretory system: Comparative physiology of excretion, Kidney, Urine formation, Urine concentration, Waste elimination, Micturition, Regulation of water balance, Electrolyte and acid-base balance. Renal Function and Hemodynamics

Unit: 3 14 Lectures

Nervous system: Neurons, action potential, Gross neuroanatomy of the brain and spinal cord, Central and peripheral nervous system, Neural control of muscle tone and posture. **Sense organs:** Vision, hearing and tactile response.

Thermoregulation and stress adaptation: Comfort zone, Body temperature – physical, chemical, Neural regulation, Acclimatization.

Unit: 4 — **14 Lectures**

Endocrinology: Endocrine glands, Hormone Structure and Function, Basic mechanism of hormone action, Hormones and diseases, Reproductive processes, Neuroendocrine regulation.

Reproduction Growth and Ageing: Males and female reproductive system. Gametogenesis, fertilization and early development: Production of gametes, cell surface molecules in sperm-egg recognition in animals. Growth rates in boys and girls, mental growth and factors influencing growth- genetic, nutritional and hormonal. Disorders of normal growth, Abnormalities of fetal and postnatal growth, Hereditary short stature. Physiology of ageing: Changes in various systems and mechanisms involved, factors affecting ageing. Apoptosis.

Suggested Reading:

1. Brody, T. (1998). *Nutritional Biochemistry*. Academic Press, USA.
2. Devlin, T.M. (2005). *Textbook of Biochemistry with Clinical Correlations*. John Wiley and Sons Inc. USA.
3. Guyton. (2007). *Textbook of medical physiology*. 11th Edition. Elsevier India Pvt. Ltd. NewDelhi.
4. Hill, R.W, Wyse, G. A. and Anderson, M. (2008). *Animal Physiology*. Sinauer AssociatesInc. USA.
5. Khurana. (2006). *Textbook of Medical Physiology*. Elsevier India Pvt. Ltd.
6. Murray, R.K. (2009). *Harper's Illustrated Biochemistry*. Jaypee Publishers, New Delhi,India.
7. Tyagi, P. (2009). *A Textbook of Animal Physiology*. Dominant Publishers and distributors,New Delhi, India.
8. Silverthorn D, (2011) *Human Physiology*, Pearson; 6th edition.
9. Sherman V. (2013)*Vander's Human Physiology*. McGraw-Hill 13thEdition.

LMM.513: Immunology. **Credit Hours: 2.**

Unit: 1 — **10 Lectures**

Immune system: Recognition of self and nonself, Humoral immunity-immunoglogulins, basic structure, classes and subclasses, structural and functional relationships, nature of antigen, antigen-antibody reaction, estimation of affinity constants. Molecular mechanisms of antibody diversity and Cellular immunity: Organization of genes coding for constant and variable regions of heavy chains and light chains. Mechanisms of antibody diversity, class switching. Lymphocytes, cytokines, interferons, Interlukins, antigen recognition-membrane receptors for antigens.

Unit: 2 — **8 Lectures**

Complement system and major histocompatibility system: Complement components, their structure and functions and mechanisms of complement activation by classical, alternative and lectin pathway. Structure and functions of Major Histocompatibility Complex (MHC) and Human Leukocyte Antigen (HLA) system, polymorphism, distribution variation and function. Association of MHC with disease and superantigen, recognition of antigens by T and B-cells, antigen processing, role of MHC molecules in antigen presentation and co stimulatory signals, tumor immunology

Unit: 3 — **8 Lectures**

Hypersensitivity: Types, features and mechanisms of immediate and delayed hypersensitivity reactions, immunity to microbes, immunity to tumors, AIDS and immunodeficiencies, hybridoma technology and vaccine, natural, synthetic and genetic, development of vaccine for diseases like AIDS, cancer and malaria.

Unit: 4 — **10 Lectures**

Monoclonal antibodies and Diagnostic immunology: Production, characterization and applications in diagnosis, therapy and basic research, immunotoxins, concept of making immunotoxins. Methods for immunoglobulin determination-quantitative and qualitative antigen and antibody reactions, agglutination-precipitation, immunoflourescence immunoblotting and assessment of human allergic diseases.

1. Kindt, T.J., Osborne, B.A. and Goldsby, R.A. (2007). *Kuby Immunology* .7th Edition. W.H. Freeman, USA.
2. Abbas. (2008). *Cellular and Molecular immunology*. CBS Publishers & Distributors, India.
3. Charles, A. and Janeway, J.R. (1994). *Immunobiology: The immune system in health and disease*. Blackwell Publishing, USA.
4. Delves, P.J., Roitt, I.M. and Seamus, J.M. (2006). *Roitt's Essential Immunology (Series–Essentials)*. Blackwell Publishers, USA.
5. Elgert, K.D. (2009). *Immunology: Understanding the immune system*. Wiley-Blackwell, USA.
6. Paul, W.E. (1993). *Fundamental Immunology*. Raven Press, SD, USA.
7. Sawhney, S.K. and Randhir, S. (2005). *Introductory Practical Biochemistry*. Alpha Science International Ltd. New Delhi, India.
8. Tizard. (2008). *Immunology: An Introduction*. Cengage Learning, Thompson, USA.

LMM.514: Regenerative Medicine and Stem Cell Therapies. **Credit Hours: 4.**

Unit: 1 **16 Lectures**

Stem Cells: Stem cells and their properties, classification of stem cells: Hematopoietic Stem Cells, mesenchymal Stem Cells, Embryonic Stem Cells, Fetal Stem Cells, adult stem cells, cancer stem cells, *in vitro* culture techniques, isolation, identification and characterization of stem cells, three dimensional culture models, stem cells in gastrointestinal , liver, pancreas, kidney, heart, spinal cord, eye diseases and cancer.

Unit: 2 **16 Lectures**

Tissue Engineering: Principles of tissue culture, tissue and organ culture, extracellular matrices, bioreactors, ethical issues related to stem cell therapies, stem cell banks, bone marrow transplantation.

Unit: 3 **20 Lectures**

Regenerative Medicine: Modes of tissue and organ delivery, tissue Engineering and transplantation techniques, immunoisolation techniques, regeneration of bone and cartilage, Islet cell transplantation and bioartificial pancreas, lung regeneration

Unit: 4 **20 Lectures**

Somatic and Germline Engineering: Basics of cell culture and media, Culturing primary cells and cell lines, suspension and adherent cultures, cell growth, growth inhibition and apoptotic studies, Embryo culture, transplantation and teratogenesis, teratomas. Stem cell culture, organ culture, artificial blood, Somatic cell fusion and somatic cell genetics, radiation hybrids.

Suggested Reading:

1. Lanza, R., Gearhart,J. (2009). *Essential of Stem Cell Biology*. Elsevier Academic Press.
2. Lanza, R., Klimanskaya, I. (2009). *Essential Stem Cells Methods*. Academic Press.
3. Mao, J. J., Vunjak-Novakovic (2008). *Translational Approaches in Tissue Engineering & Regenerative Medicine*. Artech House INC Publications.
4. Lanza, R. (2007). *Principles of Tissue Engineering, 3rd Edition*. Academic Press.
5. Stein. (2011). *Human Stem Cell Technology and Biology: A Research Guide and Laboratory Manual*. Wiley-Blackwell.
6. Lanza, R. (2004). *Handbook of Stem Cells, Two-Volume Set: Volume 1-Embryonic Stem Cells; Volume 2-Adult & Fetal Stem Cells*. Academic Press.

Related Weblinks:

1. www.stemcells.wisc.edu
2. http://stemcells.nih.gov/info/scireport/Pages/2006report.aspx
3. stemcells.nih.gov/
4. http://instem.res.in/

LMM.515: Molecular Biology **Credit Hours: 3.**

Unit: 1 14 Lectures

Structure, Conformation, Denaturation, Renaturation ofNucleic acids: Carrier of genetic information, Chemical structure of DNA and base composition,Watson-Crick model, Supercoiled DNA, Different forms of RNA: mRNA, tRNA, rRNA and other Types of RNA. Organelle DNA: mitochondria and chloroplast DNA. Chromosome Structure, Chromatin and the Nucleosome:Genome Sequence and Chromosome Diversity, Chromosome Duplication and segregation, The nucleosome, Chromatin structure: euchromatin, heterochromatin, Constitutive and facultative heterochromatin, Regulation of chromatin structure and nucleosome assembly, Nucleolus.

Unit:2 14 Lectures

Gene & Genome organization: Split genes, Overlapping genes, Transposons & retrotransposons, Gene clusters, Histones, Non-histones, Nucleosome, Chromatin, Chromosome structure in prokaryotes & eukaryotes.Basic Processes, Replication of DNA:Prokaryotic and eukaryotic DNA replication, Mechanism of DNA replication, Enzymes and accessory proteins involved in DNA replication, Replication errors, DNA damage and their repair.

Unit:3 14 Lectures

Transcription and mRNA processing: Prokaryotic &, eukaryotic transcription, general and specific transcription factors, Regulatory elements and mechanisms of transcription regulation, Transcriptional and posttranscriptional gene silencing: Initiation, Elongation & Termination of transcription, Capping, Polyadenylation, Splicing, editing, mRNA stability, RNA interference, Microarray.

Unit:4 12 Lectures

Translation: Genetic code, Prokaryotic & eukaryotic translation, the translation machinery, mechanisms of chain initiation, elongation and termination, regulation of translation, co-and post- translational modifications of proteins, Epigenetics.

Suggested Reading

1. Fasman, G.D. (1989). *Practical Handbook of Biochemistry and Molecular Biology*. CRC Press, Taylor and Francis Group, UK.
2. Gupta, P.K. (2005). *Cell and Molecular Biology*. Rastogi publications, Meerut, India.
3. James, D.W., Baker,T.A., Bell, S.P., Gann, A. (2009). *Molecular Biology of the Gene*. Benjamin Cummings, USA.
4. Jocelyn, E.K., Elliott, S.G., Stephen, T.K. (2009). *Lewin's Genes X*. Jones & Bartlett Publishers, USA.
5. Johnson, A., Lewis, J., Raff, M. (2007). *Molecular Biology of the Cell*. Garland Science, USA.
6. Lodish, H.,Berk, A., Chris, A.K and Krieger, M. (2008). *Molecular Cell Biology*. W.H. Freeman, USA.
7. Sambrook, J., Fritish, E.F., Maniatis, T. (2000). *Molecular cloning: A laboratory manual*. Cold Spring Harbor Laboratory Press, New York.

LMM.517: Techniques on Life Sciences. **Credit Hours: 3.**

Unit:1 10 Lectures

Good laboratory practices: Sterilization techniques, Spectrometry: Colorimetry, mass, UV, IR, NMR and atomic absorption spectrophotometery, Centrifugation: Principle and applications, Ultracentrifugation. Chromatography: Principle, procedure and applications of thin layer chromatography (TLC), gel filtration and ion exchange, affinity chromatography, GC, GLC, HPLC and FPLC.

Unit:2 12 Lectures

Microscopy: Light microscopy, phase contrast microscopy, fluorescent microscopy, scanning electron microscopy (SEM/FESEM), transmission electron microscopy (TEM), micrometry and photomicrography, Histochemistry, Scanning-probe microscopy, Atomic force microscopy, CLSM.

Unit:3 16 Lectures

Nucleic acids: Isolation, purification and analysis of nucleic acids. Electrophoresis: Principle of gel electrophoresis, polyacrylamide gel electrophoresis (PAGE and SDS-PAGE), agarose gel electrophoresis, pulse field gel electrophoresis (PFGE) and 2-Dimensional gel electrophoresis.

Polymerase chain reaction (PCR): Principle, types and applications, PCR based markers: RAPDs, SSRs, SNPs, ISSRs, and SCARs etc. Blotting techniques: Southern, Northern, Western, Dot blotting and hybridization, DNA fingerprinting.

Unit:4 16 Lectures

Flow cytometry: Cell sorting, Hybridoma technology/Production of antibodies, Histochemical and Immunotechniques, Immunochemical Techniques, Developing Monoclonal and Polyclonal antibodies, Immunocytochemistry, Radioimmunoassay (RIA), Enzyme Linked Immunosorbent Assay (ELISA) and Autoradiography.**Mutation Analyses Techniques:** Restriction mapping, SSCP analyses, DNA sequencing-manual and automated methods. **Cell and tissue culture techniques:** Plants and animals.

Suggested Reading:

1. Brown, T.A. (2010). *Gene cloning and DNA analysis: An Introduction*. 6th Edition, Wiley-Blackwell Publisher, New York.
2. Goldsby, R.A., Kindt, T.J. and Osborne, B.A. (2008). *Kuby Immunology*. 6th Edition, W. H. Freeman & Company, San Francisco.
3. Gupta, P.K. (2005). *Elements of biotechnology*. Rastogi Publications, Meerut.
4. Gupta, S. (2005). *Research methodology and statistical techniques*, Deep & Deep Publications (P) Ltd.New Delhi.
5. Kothari, C.R. (2008.) *Research methodology(s)*. New Age International (P) Ltd., New Delhi
6. Lewin, B. (2010). *Genes X*, CBS Publishers & Distributors. New Delhi.
7. Mangal, S.K. (2007). *DNA Markers In Plant Improvement*.Daya Publishing House,New Delhi.
8. Nelson, D. and Cox, M.M. (2009). *Lehninger Principles of Biochemistry*. W.H. Freeman and Company, New York.
9. Primrose. S.B. and Twyman, R. (2006). *Principles of Gene Manipulation and Genomics*. Blackwell Publishing Professional, U.K.
10. Sambrook, J. (2006). *The Condensed Protocols from Molecular Cloning: A Laboratory Manual*.Cshl Press New York.
11. Sambrook, J. and Russell, D.W. (2000). *Molecular Cloning: A Laboratory Manual* (3 Vol-set). 3rd Edition, CSHL Press, New York.
12. Sawhney, S.K. and Singh, R. (2005). *Introductory Practical Biochemistry*. Narosa Publishing House, New Delhi.
13. Slater, A., Scott, N.W. and Fowler, M.R. (2008). *Plant Biotechnology: The Genetic Manipulation of Plants*. Oxford University Press, USA.
14. Wilson, K. and Walker, J. (2006). *Principles and Techniques of Biochemistry and Molecular biology*. 6th Edition, Cambridge University Press India Pvt. Ltd., New Delhi.

LMM.512: Human Physiology – Practical. **Credit Hours: 1.**

1. Sensory physiology practicals
2. Equipment in the laboratory - maintenance and use.
3. Determination of hemoglobin in the blood by various methods.
4. Isolation and estimation of DNA and RNA.
5. Extraction and estimation of acid phosphatases from serum.
6. Enzyme-linked Immunosorbent assay (ELISA).
7. Electrophoresis of egg proteins.
8. Determination of urea and uric acid in the urine.
9. Estimation of glucose by different methods.

*More practicals may be added/modified from time to time depending on available facilities / faculties.

LMM.516: Molecular Biology Practical **Credit Hours: 1.**

1. Isolation of genomic DNA from bacteria (E.coli) and human blood. Quantification of DNA using spectrophotometric method.

2. RNA isolation.
3. cDNA synthesis.
4. RT-PCR.
5. Isolation of plasmid DNA from bacteria.
6. Transformation of bacteria using CaCl2 heat shock method-Competent cell preparation.
7. Digestion of DNA using restriction endonucleases, Resolution and molecular weight estimation of fragmented DNA using agarose gel electrophoresis.
8. Construction of restriction map by single and double digestion, Designing DNA probe, Southern blot hybridization (demonstration only).
9. 1Amplification of known DNA sequences by Polymerase Chain Reaction.

*More practicals may be added/modified from time to time depending on available facilities / faculties.

LMM.599: Seminar on Molecular Medicine **Credit Hours: 1.**

Semester-3											
S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				
							A	B	C	D	E
1	LMM.601	Ecology and Environment	3	-	-	3	25	25	25	25	75
2	LMM.602	Evolutionary and Developmental Biology	3	-	-	3	25	25	25	25	75
3	LMM.603	Medical Microbiology	2	-	-	2	25	25	25	25	50
4	LMM.604	Molecular Basis of Human Diseases	4	-	-	4	25	25	25	25	100
5	LMM.605	Bioinformatics	4	-	-	4	25	25	25	25	100
6	LMM.698	Dissertation-part-I			16	8	-	-	-	-	200
			16	0	8	24					600

A: Continuous Assessment: Based on Objective Type Tests
B: Pre-Scheduled Test-1: Based on Objective Type & Subjective Type Test (By Enlarged Subjective Type)
C: Pre-Scheduled Test-2: Based on Objective Type & Subjective Type Test (By Enlarged Subjective Type)
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

LMM.601: Ecology and Environment. **Credit Hours: 3.**

Unit: 1 **14 Lectures**

The Environment: Physical environment, biotic environment, biotic and abiotic interactions. Concept of habitat and niche, niche width and overlap, fundamental and realized niche, resource partitioning and character displacement.

Unit: 2 **14 Lectures**

Ecosystem: Structure and function, energy flow and mineral cycling (CNP), primary production and decomposition, structure and function of some Indian ecosystems: terrestrial (forest, grassland) and aquatic (fresh water, marine, eustarine). Types, mechanisms, changes involved in succession, concept of climax. Nature of communities, community structure and attributes, levels of species diversity and its measurement, edges and ecotones.

Unit: 3 **18 Lectures**

Population ecology: Characteristics of a population, population growth curves, population regulation, life history strategies (r and K selection), concept of metapopulation – demes and dispersal, interdemic extinctions, etc.

structured populations. Types of interactions, interspecific competition, herbivory, carnivory, pollination and symbiosis.

Unit: 4 **8 Lectures**

Environmental pollution: Global environmental change, ozone depletion, biodiversity-status, monitoring and documentation, major drivers of biodiversity change, biodiversity management approaches, Carbon credit.

Suggested Reading:

1. Odum, E. and Barrett, G.W. (2005). *Fundamentals of Ecology*. Brooks Cole, USA.
2. Prasanthrajan, M and Mahendran, P.P. (2008). *A Text Book on Ecology and Environmental Science*. Agrotech, India.
3. Sharma, P.D. (2005).*Ecology and Environment*.Rastogi Publications, Meerut, India.
4. Verma,P.S. Agarwal,V. K. (2000). *Environmental Biology: Principles of Ecology*. S. Chand, New Delhi, India.

LMM.602: Evolutionary and Developmental Biology. **Credit Hours: 3.**

Unit: 1 **16 Lectures**

Emergence of evolutionary thoughts & Origin of life: Lamarckism, Darwinism, Concepts of variation, adaptation, struggle, Mendelism, Spontaneity of mutations, Theories of phyletic gradualism vs. punctuated equilibria, Modern evolutionary synthesis. Origin of basic biological molecules, Abiotic synthesis of organic monomers and polymers, Concept of Oparin and Haldane, Experiment of Miller (1953), The first cell, Evolution of prokaryotes, Origin of eukaryotic cells, Evolution of unicellular eukaryotes, Anaerobic metabolism, Photosynthesis and aerobic metabolism.

Unit: 2 **14 Lectures**

Paleontology and molecular evolution: The evolutionary time scale, Eras, periods and epoch, Major events in the evolutionary time scale, Origins of unicellular and multicellular organisms, Stages in primate evolution including*Homo sapiens*. Concepts of neutral evolution, Molecular divergence and molecular clocks, Molecular tools in phylogeny, Classification and Identification, Origin of new genes and proteins, Gene duplication and divergence.

Unit: 3 **14 Lectures**

Basic concepts of development: Totipotency, Commitment, Specification, Induction, Competence, Determination and Differentiation, Morphogenetic gradients, Cell fate and cell lineages, Stem cells, Genomic equivalence and the cytoplasmic determinants, Imprinting, Mutants and transgenics in analysis of development.

Unit: 4 **10 Lectures**

Gametogenesis, fertilization and cell death: Production of gametes, Cell surface molecules in sperm-egg recognition in animals; Embryo-sac development and double fertilization in plants, Zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals, Embryogenesis and establishment of symmetry in plants, Seed formation. Hypersensitive response, functions, relevance with diseases, apoptosis, Caspases, Importance of PCD in plant development, role of PCD, model of PCD.

Suggested Reading:

1. Darwin, C.R. (1911). *On the origin of species by means of natural Selection, or preservation of favoured races in the struggle for life*. Hurst Publishers, UK.
2. Dawkins, R. (1996). *The Blind Watchmaker*, W.W. Norton & Company Jones and Bartlett Publishers.
3. Futuyma, D.J. (2009). *Evolution*. Sinauer Associates Inc. USA.
4. Hake, S. and Wilt, F. (2003). *Principles of Developmental Biology*. W.W. Norton & Company, New York, USA.
5. Hall, B.K. and Hallgrimsson, B. (2007). *Strickberger's Evolution*.Jones and Bartlett Publishers, India.
6. Lewin, R. (2004). *Human Evolution - An Illustrated Introduction*. Wiley-Blackwell, USA.
7. Scott, F. and Gilbert, S.F. (2010). *Developmental Biology*. Sinauer Associates, Inc. USA.
8. Slack, J.M.W. (2005). *Essential Developmental Biology*. Wiley-Blackwell, USA.

LMM.603: Medical Microbiology. Credit Hours: 2.

Unit: 1 10 Lectures

Prokaryotic, Eukaryotic structure and function: Cell structure and function, Classifications. Bacteria, Fungi, Protozoa, Algae, and viruses, Structure of major viruses, and Viral replication.

Unit: 2 8 Lectures

Growth, nutrition & control: Phases in bacterial growth, Growth Curve, Calculation of G-time, Physical and environmental requirements of growth, Microbial nutritional requirements, Types of culture media. Physical and Chemical methods, Antimicrobial drugs, Antibiotic assays, Drug resistance in bacteria.

Unit: 3 6 Lectures

Microbial Genetics: DNA replication, Transcription and translation, Operon, Horizontal Gene Transfer.

Unit: 4 12 Lectures

Applied Microbiology: Environmental microbiology, Microbial ecology, Aquatic Microbiology, Food, Dairy and Agricultural Microbiology, Industrial Microbiology. Major bacterial diseases of animals and plants, Airborne, Food-borne, Soil-borne, Nosocomial and Sexually Transmitted/Contagious Diseases, Principles of disease and epidemiology, Host-Microbe relationship, Viral pathogenesis, Major viral diseases of plants and animals.Avian Influenza A/H5N1, A/H1N1 Swine Influenza, SARS, AIDS, Japanese encephalitis, Malaria and Tuberculosis, West Nile, Mechanisms of emergence and reemergence.

Suggested Reading:

1. Bauman, R.W. (2011). *Microbiology with Diseases by Body System*. Benjamin Cummings, USA.
2. Capuccino, J.G. and Sherman, N. (2004). *Microbiology-A Laboratory Manual*. Benjamin Cummings, USA.
3. Pelczar, M. J., Chan, E.C.S. and Krieg, N.R. (1993). *Microbiology: Concepts and Applications*. McGraw-Hill Inc. USA.
4. Pommerville, J.C. (2010). *Alcamo's Fundamentals of Microbiology*. Jones & Bartlett Publishers, USA.
5. Prescott, L.M., Harley, J.P. and Klein, D.A. (2004). *Microbiology*. McGraw-Hill Science, USA.
6. Strelkauskas, A., Strelkauskas, J. and Moszyk-Strelkauskas, D. (2009). *Microbiology: A Clinical Approach*. Garland Science, New York, USA.
7. Tortora, G.J., Funke, B.R. and Case, C.L. (2009). *Microbiology: An Introduction*. Benjamin Cummings, USA.

LMM.604: Molecular Basis of Human Diseases. Credit Hours: 4.

Unit: 1 16 Lectures

Host-pathogen Interactions: Infectious diseases, host-pathogen interactions, genetic susceptibility to infection. Entry of pathogens into the host; colonization and factors predisposing to infections; types of toxins and their structure; Mode of actions, host signalling in response to infections, bacterial two component signaling systems, bacterial adhesins, virulence factors, bacterial biofilms and applications

Unit: 2 18 Lectures

Genetic disorders: Common genetic disorders due to altered chromosome numbers, aberrations; Diabetes as a genetic disease, recessive genetic disorders, Intersex Disorders:Male Pseudo-hermaphrodite (MPH) including testicular feminization syndrome, Female Pseudo-hermaphrodite (FPH) including congenital adrenal hyperplasia, True Hermaphrodites (TH), Mixed gonadal dysgenesis (MGD) &Dysgenetic male pseudohermaphrodite (DMP) and Persistent Mullerian duct syndrome (PMDS), diabetes and other complex human diseases.

Unit: 3 18 Lectures

Disorders of Haematopoitic and Muscular System and Multifactorial diseases: Haematopoietic systems - Sickle cell anemia, Thalassemias and Haemophilias and Haematopoietic Malignancies. Muscular Dystrophy. Molecular and genetic basis of Diabetes, Dementia, Schizophrenia, Cancer, Coronary Artery diseases, Hypertension and neuronal disorders such as Autism, Alzheimer's and Parkinson. Mental Retardation.

Unit: 4 20 Lectures

Mechanisms of Infection and Therapeutic Interventions: Protein and DNA secreting systems and pathogenicity island. Molecular basis of antimicrobial resistance and its detection. Molecular approaches in clinical microbiology.

antimicrobial agents; Sulfa drugs; Antibiotics: Penicillins and Cephalosporins; Broad-spectrum antibiotics: Antibiotics from prokaryotes; Antifungal antibiotics; Mode of action; Resistance to antibiotics.
Chemo, Radio, Gene and Stem Cell Therapies: Anticancer drugs targeting genomic DNA, radiations to kill abnormal cells, gene therapies in various diseases, problems in gene therapy, ethical and biosafety issues in gene therapies, current stem cell therapies, stem cells in heart, brain and spinal cord regeneration.

Suggested reading:

1. Patch, H. S. C. (2009). *Genetics for the Health Sciences*. Scion Publishing Ltd., UK.
2. Brown, S. M., (2009). *Essentials of Medical Genomics*. Wiley-Blackwell.
3. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009), *Lewin's Gene X*. Jones &Barlett.
4. Milunsky, A., Milunsky, J. (2009). *Genetic Disorders and the Fetus: Diagnosis, Prevention and Treatment, 6th Edition*. Wiley-Blackwell publishers.
5. Trent, R. J. (2010). *Molecular Medicine, Fourth Edition: Genomics to Personalized Healthcare*. Academic Press.
6. Trent, R. J. (2005). *Molecular Medicine: An Introductory Text*. Academic Press.
7. Elles, R. and Mountford, R. (2012). *Molecular Diagnosis of Genetic Diseases* ***Series:*** *Methods in Molecular Medicine.*
8. Coleman, W. B. and Tsongalis, G. J. (2009). Molecular Pathology: The Molecular Basis of Human Disease. Academic Press.
9. Nussbaum, R.L., McInnes, R. Mc., Willard, H.F. (2009). ***Genetics in Medicine***. Elsevier Inc., Philadelphia.
10. Read A and Donnai D (2007). *New clinical Genetics*. Scion Publishing Lmt., Oxfordshire, UK.

Related Weblinks

http://www.journals.elsevier.com/bba-molecular-basis-of-disease/
http://biology.gsu.edu/mbd/

LMM.605: Bioinformatics. **Credit Hours: 4.**

Unit: 1 **20 Lectures**

Biological databases: Nucleotide Sequence Databases, GenBank, DDBJ, EMBL, Sequence Flatfile and submission process, Protein sequence databases, UniProt in detail, Mapping databases, Genomic databases, Data mining.
Sequence analysis: Gene Prediction methods and programs, Markov and Hidden Markov models in gene prediction, Promoter analysis, RNA secondary structure thermodynamics, Dynamic programming and genetic algorithms for secondary structure prediction, refining multiple sequence alignment based on RNA secondary structure predictions, Vienna RNAfold, Evolution and origins of sequence polymorphisms, SNP discovery methods and databases, Genotyping, International haplotype map project, 1000 genomes project.
Analysis for protein sequences: Predicting features of individual residues, Predicting function, Neural networks, Protein structure prediction, Protein structure databases, PDB in detail, 3D visualization softwares, Pathway and molecular interaction databases, Prediction algorithms for pathways and Molecular Interactions, Integrating gene expression data with pathway information.

Unit: 2 **18 Lectures**

Inferring relationships: Global Vs. local sequence alignments, Dotplots, Scoring matrices, Pairwise sequence alignment, BLAST, Position-Specific scoring and PSI-BLAST, MegaBLAST, BL2SEQ, BLAT, FASTA Vs BLAST, Protein multiple sequence alignments, Multiple structural alignments, Shotgun sequencing, Sequence assembly and finishing.
Phylogenetic analysis: Basics of phylogenetics, Nucleotide substitution models and selection, Distance-matrix-based methods, Neighbor-Joining, Fitch-Margoliash, Outgroups, UPGMA, Minimum evolution, Maximum parsimony, Maximum likelihood, Bayesian inference, Searching for trees, Rooting trees, Bootstrapping, Likelihood ratio tests.

Unit: 3 **18 Lectures**

Genomics: Comparative genomics, Genomic alignments, Gene predictions in genomic alignments, Genome-wide association study, Phylogenetic footprinting, Gene annotation, Gene expression analysis using DNA Microarray, Annotation of array probes, Image processing, Normalizing expression measurements.

Proteomics: Major proteomic approaches, Protein analysis by MALDI and SELDI methods, Time of Flight MS in protein analysis, Protein Identification by Mascot, Peptide Mass fingerprinting, Comparative proteomics, protein docking site, potential interactome prediction, prediction of chemical nature of protein, UniProt, Expassy. Two-Dimensional polyacrylamide gel electrophoresis.

Unit: 4 **16 Lectures**

Modelling and structure: From protein sequence to structure, theoretical and practical aspects of protein sequence alignments, secondary, tertiary structure prediction, comparative modeling, Docking, protein-protein and protein-ligand docking. Techniques for 3-D structure determination like X-ray, NMR, MS/MS analysis.

Computational drug designing: Structure-based drug design, virtual screening, quantitative structure activity relations. Cheminformatics and pharmacophore mapping in therapeutic development.

Suggested reading

1. Baxevanis, A.D. and Ouellette, B.F.F. (2005). *Bioinformatics: A Practical Guide to the Analysis of Genes and Proteins*. Wiley-Interscience, USA.
2. Hall, B.G. (2011). *Phylogenetic Trees Made Easy: A How-To Manual*. Sinauer Associates, Inc. USA.
3. Lesk, A.M. (2008). *Introduction to Bioinformatics*. Oxford University Press, UK.
4. Zvelebil, M. and Baum, J. (2007). *Understanding Bioinformatics*, Garland Science, New York, USA.
5. Ramsden, J. (2010). *Bioinformatics: An Introduction (Computational Biology)*. Springer, India.
6. Ye, S.Q. (2008). *Bioinformatics: A Practical approach*. Chapman & Hall/CRC, UK.
7. Mount, D. (2012). Bioinformatics: Sequence and Genome Analysis. Cold Spring Harbor Laboratory Press.
8. Graur, D., Li, W. H. (2000). *Fundamentals of Molecular Evolution*. Sinauer Associates.
9. Tisdall, J. (2001). *Beginning Perl for Bioinformatics*. O'Really Publishers.
10. Orengo, C., Jones, D., Thornton, J. (2005). *Bioinformatics: Genes, Proteins and Computers* (Advanced Texts). Taylor and Francis Publishers.

LMM.698: Dissertation Part – I

Course Objective: The objective of dissertation part I would be to ensure that the student learns the nuances of the scientific writing. Herein the student shall have to write his synopsis including an extensive review of literature with simultaneous identification of scientifically sound (and achievable) objectives backed by a comprehensive and detailed methodology.

The Evaluation criteria shall be multifacted as detailed below: **Total marks 200**

S.No.	Criteria	Marks allotted
1.	Review of literature:	50
2.	Identification of gaps in knowledge:	20
3.	Objective formulation:	50
4.	Methodology	50
5.	References	30

The synopsis shall be evaluated by a three membered committee consisting of

a. COC of the department
b. Supervisor or Co-supervisor
c. One faculty of allied department

Central University of Punjab, Bathinda

Centre For Human Genetics and Molecular Medicine

M.Sc. Life Sciences Specialization in Molecular Medicine

Semester-4											
S.No	Paper Code	Course Title	L	T	P	Cr	% Weightage				
							A	B	C	D	E
1	LMM.606	Genetic Engineering and Recombinant Therapeutics	4	-	-	4	25	25	25	25	100
2	LMM.607	Clinical Biotechnology	4	-	-	4	25	25	25	25	100
3	LMM.699	Dissertation Part-II			32	16	-	-	-	-	400
			6	0	32	24					600

A: Continuous Assessment: Based on Objective Type Tests
B: Pre-Scheduled Test-1: Based on Objective Type & Subjective Type Test (By Enlarged Subjective Type)
C: Pre-Scheduled Test-2: Based on Objective Type & Subjective Type Test (By Enlarged Subjective Type)
D: End-Term Exam (Final): Based on Objective Type Tests
E: Total Marks
L: Lectures T: Tutorial P: Practical Cr: Credits

LMM.606: Genetic Engineering and Recombinant Therapeutics. Credit Hours: 4.

Unit: 1 **16 Lectures**

Restriction enzymes their types, Type I, II and III, restriction modification systems, Cohesive and blunt and ligation, linkers, adaptors, homopolymeric tailing, transformation, transfection: chemical and physical methods, sequencing and clone confirmation, expression optimization, *in-silico* methods of design.

Unit: 2 **16 Lectures**

Gene Cloning Vectors: Plasmids, bacteriophages, cloning in M13 mp Vectors, phagemids, Lamda vectors; insertion and replacement vectors, EMBL, λ DASH, λ gt10/11, λZAP etc. Cosmid vectors.

Unit: 3 **20 Lectures**

Expression Vectors: Artificial chromosome vectors (YACs, BACs), Animal virus derived vectors-Sv-40, caccinal/bacculo& retroviral vectors. Expression vectors; pMal, GST, PET – based vectors. Protein purification; His-tag, GST-tag, MBP-tag.Restriction proteases, intein-based vectors. Inclusion bodies methodologies to reduce formation of inclusion bodies, *baculovirus* and pichia vectors system. Site-directed Mutagenesis.

Unit: 4 **20 Lectures**

Techniques and Applications of recombinant DNA technology: Isolation and Detection of DNA, RNA and proteins by Southern blotting, Northern blotting, western blotting and *in situ* hybridization techniques. Sites pecific mutagenesis: Yeast two hybrid system, phage display, characterization of expressed proteins through various biophysical, biochemical methods. Gene mapping and Microarrays. Genetically modified microbes (Recombinant bacteria) for the production of commercial scale production of proteins and pharmaceuticals, antibiotics, enzymes, insulin, growth hormones, monoclonal antibodies. Applications rDNA in diagnosis of pathogens and abnormal genes. Transgenic animals. Transgenic animals for production of proteins and pharmaceuticals. Genetically modified insect cells for the production of commercially important bioproducts.

Suggested Reading:

1. R.W. Old & S.B. Primrose (2007) *Principles of Gene Manipulation* 7th Edition Blackwell science.
2. Bernard R. Glick & Jack J. Pasternak. (2010) *Molecular Biotechnology* 4th Edition ASM Press Washington.
3. James, Watson Micheal Gilman Jan Witkowsk (2007) *Recombinant DNA* 3rd-edition . CSHL, New York.
4. CokinRateldge and Bjorn Christiansen, (2006) *Basic Biotechnology* 3rd Edition Cambridge University press.
5. John E. Smith. (2009) *Biotechnology* 5th Edition by Cambridge University press.
6. *Molecular Biology of Gene* 6th Edition by Watson CSHL Press New York.

7. Sambrook & Russell *Molecular cloning*, CSHL Press, New York.
8. David & Freifelder John &Barlett (2008) *Molecular biology* 2nd Edition, Narosa Publishing , New Delhi.

Related Weblinks:

http://www.genengnews.com/ontheweb.asp
http://www.ige-india.com/
http://www.icgeb.org/~bsafesrv/
http://www.livescience.com/32648-whats-genetic-engineering.html

LMM.607: Clinical Biotechnology **Credit Hours: 4**

Unit: 1 **18 Lectures**

Medical diagnostics: Importance of diagnostic tools, Instruments used in medical diagnostics, imaging techniques, bioethics, biosafety and IPR issues.

Unit: 2 **18 Lectures**

Clinical Pathology: Analyses of body fluids and tissues and from various disciplines of microbiology, serology, clinical chemistry, hematology, transfusion medicine, cytogenetics.

Unit: 3 **18 Lectures**

Clinical Laboratory Sciences: Urine analysis to measure general health, collection methods, physical Examination of Urine, chemical Examination of Urine, microscopic Examination of Urine, blood, glucose or protein detection in urine, disease association. Blood group and Rh factor, Clinical correlation of RBC and WBC counts, Platelets and Health, Blood clotting disorders, Blood cancers. Histopathology: Grossing of tissue, tissue processing, fixation of tissue, section cutting, staining techniques, Hematoxylin and Eosin and Special Stains, Immunohistochemistry and immunofluorescence techniques.

Unit: 4 **18 Lectures**

Gene therapy in various diseases. Vectors used in gene therapy Biological vectors – retrovirus, adenoviruses, Herpes Synthetic vectors– liposomes, receptor mediated gene transfer. Gene therapy trials – Familial Hypercholesterolemia, Cystic Fibrosis, Solid tumors. Cell and tissue engineering: Stem cell Potential use of stem cells – Cell based therapies, Nanomedicine. **Chromosomal disorders**: autosomal; sex chromosomal; karyotype analysis, G-banding, in situ hybridization (FISH and on-FISH), and comparative genomic, hybridization (CGH).Cancer cytogenetics: spectral karyotyping, DNA diagnostics: PCR based diagnostics; ligation chain reaction, southern blot, diagnostics, array-based diagnostics, DNA sequencing, genetic profiling, single nucleotide polymorphism.

Suggested reading:

1. Jocelyn, E. K., Elliot, S. G., Stephen, T. K. (2009), *Lewin's Gene X*. Jones &Barlett.
2. Milunsky, A., Milunsky, J. (2009). *Genetic Disorders and the Fetus: Diagnosis, Prevention and Treatment, 6th Edition*. Wiley-Blackwell publishers.
3. Patch, H. S. C. (2009). *Genetics for the Health Sciences*. Scion Publishing Ltd., UK.
4. Brown, S. M., (2009). *Essentials of Medical Genomics*. Wiley-Blackwell.
5. Lodish, H., Berk, A., Chris, A. K., Krieger, M. (2008), *Molecular Cell Biology*. W.H. Freeman, USA.
6. Kingston H (2002) *ABC of Clinical Genetics*. Blackwell BMJ books, 3rd edition.
7. McPherson and Pincus. *Henry's Clinical Diagnosis and Management* by Laboratory Methods. 22nd edition, Saunders Publishing Company

Related Weblinks:

http://csu-cvmbs.colostate.edu/vth/diagnostic-and-support/clinical-pathology/Pages/default.aspx
http://www.hopkinsmedicine.org/healthlibrary/conditions/pathology/clinical_pathology_overview_85,P00965/
http://www.biomedcentral.com/bmcclinpathol
http://www.genome.gov/11508982

Ph.D. Molecular Medicine Course Work

S.No.	Course Code	Course Title	L	T	P	Cr	E
1	LML.701	Research Methodology and Biostatistics	5			5	100
2	LML.702	Bioethics, Biosafety and Good Laboratory Practices	4	-	-	4	100
3	LML.703	Trends in Molecular Medicine	5	-	-	5	100
4	LML.704	Advanced Techniques in Cellular and Molecular Biology	5	-	-	5	100
5	LMS.799	Seminar	-	-	-	1	100
		TOTAL				20	600

LML.701: Research Methodology and Biostatistics **Credit Hours: 5**

Learning Objective: This course will help students to understand the complex outcome of their results using biostatistical approaches in testing hypothesis, designing experiments, analyzing experimental data and interpreting the results of biological research.

Unit:1 **20 Lectures**

General principles of research: Meaning and importance of research, Critical thinking, Formulating hypothesis and development of research plan, Review of literature, Interpretation of results and discussion.

Technical writing: Scientific writing, Writing synopsis, Research paper, Poster preparation and Presentations and Dissertation; IPR and related issues.

Unit:2 **20 Lectures**

General Statistics: Difference between parametric and non-parametric statistics, Univariant and multivariant analysis, Confidence interval, Errors, Levels of significance, Hypothesis testing. Measures of central tendency and dispersal, Histograms, Probability distributions (Binomial, Poisson and Normal), Sampling distribution, Kurtosis and skewness

Unit:3 **25Lectures**

Comparative Statistics: Comparing means of two or more groups: Student's t-test, Paired t-test, Mann-Whitney U-test, Wilcoxon signed-rank, One-way and two-way analysis of variance (ANOVA), Critical difference (CD), Fisher's LSD (Least significant difference), Kruskal–Wallis one-way ANOVA by ranks, Friedman two-way ANOVA by ranks, Chi-square test

Regression and correlation: Standard errors of regression coefficients, Comparing two regression lines, Pearson Product - Moment Correlation Coefficient, Spearman Rank correlation coefficient, Power and sampling size in correlation and regression.

Unit: 4 **25 Lectures**

Fundamentals of computer: Parts of computer, Hardware, BIOS, Operating systems, Binary system, Logic g ates and Boolean algebra. Application software: Spreadsheet applications, Word-processing applications, Presenta tion applications, Internet browsers, Reference Management, and Image processing applications. Computer languzige: Basic DOS commands, AutoHotKey scripting language, HTML and basic structure of a webpage, Designing websites. World wide web: Origin and concepts, Latency and bandwidth, Searching the internet, Advanced web-search using Boolean logic, Cloud computing.

Suggested Reading:

1. Gupta, S. (2008). *Research Methodology and Statistical Techniques*.Deep and Deep Publications (P) Limited, New Delhi.
2. Kothari, C. R. (2014). *Research Methodology (s)*.New Age International (p) Limited. NewDelhi.
3. Sahay, Vinaya and Pradumna Singh (2009). *Encyclopedia of Research Methodology in life Sciences*. Anmol Publications New Delhi
4. Kauda J. (2012). *Research Methodology: A Project Guide for University Students*. SamfundsLitteratur Publications.
5. Dharmapalan B. (2012). *Scientific Research Methodology*.Narosa Publishing House ISBN. 978-81-8487-180-7.
6. Norman, G. and Streiner, D. (2008). *Biostatistics: The Bare Essentials*.3/e (with SPSS). Decker Inc. USA.
7. Rao, P. P., Sundar,S.,and Richard, J. (2009). *Introduction to Biostatistics and ResearchMethods*.PHI learning.
8. Christensen, L. (2007). *Experimental Methodology*. Boston: Allyn & Bacon.
9. Clive Opie (2004). *Doing Educational Research- A Guide for First time Researchers*. New Delhi: Vistar Publications.
10. Fraenkel, J.R , Wallen, N.E (2009). *How to Design and Evaluate Research in Education*. 7th edition. New York: McGraw Hill.
11. Kumar Ranjit (2011). *Research Methodology: A Step-by-Step Guide for Beginners Field*. Sage Publications.

LML702: Bioethics, Biosafety and Good Laboratory Practices **Credit Hours: 5.**

Learning Objective: The students will be learning the best laboratory practices, basic principles of biosafety, bioethics from the research, clinical and medical prospective..

Unit1 **20 Lectures**

Introduction and Principals of Good Lab Practice: Good laboratory practices, Biosafety for human health and environment. Biosafety issues for using cloned genes in medicine, agriculture, industry, and ecoprotection. Biological warfare, Biological containment and physical containment, CDC Biosafety levels, Biosafety in Clinical laboratories and biohazard management.

Unit2 **20 Lectures**

Bioethics and Biosafety in Molecular Biology: Gene pollution, Biological invasion, Risk and safety assessment from genetically engineered organisms, special procedures for r-DNA based products.

Unit3 **25 Lectures**

Research ethics: Ethical theories, Ethical considerations during research, data manipulations, subject consent, Animal testing, Animal rights, Perspectives and methodology, Ethical issues of the human genome project.

Unit4 **25 Lectures**

Medical and Clinical Ethics: Code of Ethics in Medical/clinical laboratories, healthcare rationing, ethical issues of xenotransplantation, Ethics involved in embryonic and adult stem cell research, Ethics in Assisted Reproductive Technologies: animal and human cloning and *in-vitro* fertilization, the element of Informed Consent, Ethical issues in MTP and Euthanasia.

Suggested Reading:

1. Fleming, D. O. and Hunt, D L. (2006). *Biological Safety: Principles and Practices*. American Society for Microbiology, USA.
2. Rockman, H. B. (2004). *Intellectual Property Law for Engineers and Scientists*. Wiley-IEEE Press, USA.
3. Shannon, T. A.(2009). *An Introduction to Bioethics*. Paulist Press, USA.
4. Vaughn, L. (2009). *Bioethics: Principles, Issues, and Cases*. Oxford University Press, UK.

3. *stemcells.nih.gov/*
4. http://instem.res.in/

LML.704: AdvancedTechniques in Cellular and Molecular Biology. Credit Hours: 5.

Learning Objective: The students will understand the molecular processes of DNA replication, transcription, and translation, and how they are managed in cells and the advanced techniques based of these processes.

Unit:1 18 Lectures

Genomics: Chromatin remodeling studies, ChIP and chromatin dynamics, *in-vitro* transcription and translation (IVT and IVTT), Southern, Northern and dot blotting, selection of DNA/ RNA probes, PCR, RT and real time PCR, ChIP on ChIP and cDNA arrays, models to study DNA damage repair and replication, EMSA, reporter assays for finding active regions in DNA, construction of cDNA and genomic libraries.

Unit:2 18 Lectures

Proteomics: Protein expression systems: bacterial, yeast and mammalian, tagging of recombinant proteins with His or FLAG tags, fluorescent proteins: green, red or yellow; protein localization studies, performing import-export inhibition assays, recombinant proteins and human health.

Unit:3 18 Lectures

Molecular Biology tools for interactomics: DNA-DNA, DNA-protein, RNA-DNA, RNA-Protein, protein-protein interactions and their role in signal transduction, 6-C technique, DNase protection assay, two and three hybrid systems (yeast and mammalian), Immunoprecipitation, pull down assays, FISH and confocal analysis for intracellular interactions, appropriate antibody selection for immune-assays, types and applications of ELISA, confocal and live cell imaging, flow cytometer and cell sorting.

Unit:4 18 Lectures

Culture techniques: mammalian cell culture, media for animal cell culture, construction of cell lines, transfection, electroporation, cell lines as *in-vitro* model for research, MTT assay, zymography, flow cytometry and cell cycle analysis; Microscopy.

Suggested Readings:

1. Fasman, G.D. (1989). *Practical Handbook of Biochemistry and Molecular Biology*. CRC Press, Taylor and Francis Group, UK.
2. Gupta, P.K. (2005). *Cell and Molecular Biology*. Rastogi publications, Meerut, India.
3. James, D.W., Baker, T.A., Bell, S.P., Gann, A. (2009). *Molecular Biology of the Gene*. Benjamin Cummings, USA.
4. Jocelyn, E.K., Elliott, S.G., Stephen, T.K. (2013). *Lewin's Genes X*. Jones & Bartlett Publishers, USA.
5. Johnson, A., Lewis, J., Raff, M. (2007). *Molecular Biology of the Cell*. Garland Science, USA.
6. Lodish, H., Berk, A., Chris, A.K. and Krieger, M. (2012). *Molecular Cell Biology*. W.H. Freeman, USA.

LMS.799: Credit Seminar Credit Hours: 1.

Learning Objective: This will help the student in developing the effective oral and writing skills to communicate scientific data and ideas and make them aware about the recent trends and developments in molecular medicine.

5. WHO (2005). *Laboratory Biosafety Manual*. World Health Organization.

Related Weblinks:

1. http://www.absa.org/resbslinks.html
2. http://bch.cbd.int/protocol/
3. http://global.oup.com/uk/orc/law/ip/macqueen2e/resources/weblinks/
4. http://www.icgeb.org/~bsafesrv/

LML.703: Trends in Molecular Medicine **Credit Hours: 4.**

Learning Objective: The students will understand the background of molecular medicine i.e. molecular/cell biology relevant to medical applications. It will enhance their understanding how normal cellular processes change, fail or are destroyed by disease development, in particular for genetic diseases and role of modern therapeutics

Unit-1 12 Lectures

Molecular basis of Metabolic, Infectious and Non-infectious diseases: Human genetics relevant to molecular medicine, human genome organization and variations, single nucleotide polymorphisms, multiple gene polymorphisms, single and multi-gene diseases, gene-environment interactions in disease manifestation, genetic and physical mapping of human genome and identification of diseases gene, gene therapy and recombinant molecules in medicine and therapeutic development. Antiviral therapies, vehicles for genetic therapies, construction of knock-out and transgenic animals.

Unit-2 18 Lectures

Signal Transduction and its Role in Human Diseases: Cellular and tissue microenvironment in diseases, drug resistance with convention chemotherapies, clinical trials, adjuvant therapies, monoclonal antibodies as drugs, nanobiotechnology and its applications in molecular medicine, next generation sequencing techniques.

Unit-3 18 Lectures

Stem Cells and Regenerative Medicine: Stem cells and their properties, classification of stem cells: Hematopoietic Stem Cells, mesenchymal Stem Cells, Embryonic Stem Cells, Fetal Stem Cells, adult stem cells, cancer stem cells, isolation, identification and characterization of stem cells, tissue and organ culture, tissue Engineering and transplantation techniques.

Unit-4 12 Lectures

Molecular Pharmacogenetics and Therapeutics: Gene therapy and recombinant molecules in medicine and therapeutic development. Antiviral therapies, vehicles for genetic therapies, construction of knock-out and transgenic animals, Stem cell research and its application in human health, pharmacogenomics, its application and role in developing novel therapies. RNAi and human diseases, alternate splicing and human disease

Suggested Reading:

1. Littwack, G. (2008). *Human Biochemistry and Disease*. Academic Press
2. Trent, R. J. (2012). *Molecular Medicine*, Fourth Edition: Genomics to Personalized Healthcare Academic Press.
3. Elles, R., Mountfield, R. (2011). *Molecular Diagnosis of Genetic Diseases*. Springer Publication.
4. Lanza, R., Gearhart,J. (2009). *Essential of Stem Cell Biology*. Elsevier Academic Press.
5. Lanza, R., Klimanskaya, I. (2009). *Essential Stem Cells Methods* Academic Press
6. Mao, J. J., Vunjak-Novakovic (2008). *Translational Approaches in Tissue Engineering & Regenerative Medicine*. Artech House INC Publications.
7. Lanza, R. (2007). *Principles of Tissue Engineering, 3rd Edition*. Academic Press.
8. Stein. (2011). *Human Stem Cell Technology and Biology: A Research Guide and Laboratory Manual*. Wiley-Blackwell

Related Weblinks:

1. www.stemcells.wisc.edu
2. http://stemcells.nih.gov/info/scireport/Pages/2010report.aspx

CENTRAL UNIVERSITY OF PUNJAB Annexure 19.22

RESEARCH ADVISORY COMMITTEE (RAC)

MINUTES OF FIRST MEETING

The first meeting of RAC was held on the 21st November, 2015 at 10.30 a.m. in the Committee Room of Visitor's Hostel at IISER; Mohali. The following members attended this meeting:

1. Prof. R. K. Kohli, Vice-Chancellor	In Chair
2. Prof. A. K. Dhawan,	Chairman, RAC
3. Prof. N. Sathyamurthy	Member
4. Prof. Veer Singh	Member
5. Prof. V.K. Kapoor	Member
6. Prof. Rajesh Gill	Member
7. Prof. Sohinderbir Singh	Member
8. Prof. Nandita Shukla	Member
9. Prof. S.V. Kessar	Member
10. Prof. P. Ramarao	Special Invitee
11. Prof. R. G. Saini	Special Invitee
12. Ms. Shweta Arora	Secretary

Prof. K. N. Pathak and Prof. R. K. Tuli could not attend because of their preoccupation.

At the beginning, Professor A. K. Dhawan moved a resolution that this being the first meeting of RAC should be chaired by Professor R. K. Kohli, Vice Chancellor, CUPB. The resolution was accepted and Professor R. K. Kohli was in Chair.

The Chairman thanked the RAC Chairman and members and welcomed them to the first meeting. He emphasized that CUPB was a multi faculty and multi-cultural mini India, where different states of India were represented. He said that the vision of the university is focused on research. The university is not considering starting of UG programmes as current infrastructure does not allow further growth. He also pointed out that the university is focusing on PG and Ph.D. programmes and was interested in excellence and not in mere horizontal growth. He, with great pleasure, told the members that the research output of university is comparable to any good higher education institution in the country. He looks upon at RAC as a good advisory board to further guide and show direction towards excellence in research. He once again welcomed all and asked Professor Dhawan to present the agenda.

Thereafter, Professor A. K. Dhawan presented the agenda items and the following decisions were taken:

Agenda 1/2015/1: Report of Research Activities at CUPB and Review by RAC

The members of RAC noted the progress and were very appreciative of it. The members also appreciated the standard of Faculty recruitment in CUPB. While reviewing the existing

facilities at CUPB, RAC pointed out the need to procure an NMR and an Animal house at CUPB. The following points emerged from the discussion:

(a) On the need to add NMR to the Central Instrumentation laboratory of CUPB, it was explained to the members that this instrument is much needed. However, because we are to shift to a new campus, it is advised that the electromagnetic field once established is not allowed to be disturbed. Therefore, it would be purchased once the University shifted to its new Campus. It was also suggested that since purchasing such equipment needs processing time, proposal to purchase could be started. By the time building at the new campus is ready, the equipment will be available for installation. As regards x-ray diffraction, there is need for composites, Nano-material and Macro molecules proteins etc. Professor Sathyamurthy emphasized that three separate equipment be purchased for each function rather than the composite.

(b) Similarly, Animal house could not be constructed because CUPB is housed in a temporary Campus. It will be added in the new campus or possibility of a temporary Animal house at the city campus will be explored.

Agenda 1/2015/2: Review of Internally and Externally funded Research Projects in operation at CUPB

The RAC was informed that CUPB has in operation 24 internally funded and 60 externally funded research projects with a total grant of Rs. 13.76 crores. In addition, 7 projects worth Rs. 0.85 crores have been completed recently. CUPB faculty have competed for research grants from all major funding agencies including DST, DBT, UGC, ICMR, CSIR etc. The details of budget, objectives and current status were put up to RAC.

The committee appreciated the progress made by CUPB.

Agenda 2/2015/3: Identification of Major/ Thrust areas for Research at CUPB

RAC was informed that CUPB has state-of-the-art facilities for research and training of students in the areas of Biological Sciences, Chemical and Pharmaceutical Sciences, Environmental Sciences, Human Genetics, Molecular Medicine and Computer Science and Technology.

On the need to identify the thrust for more focussed research, the general consensus was that the universities should not go for directed-research like Govt. organizations or mission based projects like corporate sector. In the Academic model, the university promotes individual excellence. The Vice chancellor assured that the Faculty will have full freedom to choose their path and creativity should not be restrained.

However it was pointed out that pharmaceutical chemistry, life sciences and environmental sciences being the key areas of focus at CUPB and many of the faculty members focussing on molecular biology and cancer research, these have obviously come up as strength areas of CUPB. Other points that emerged from discussion were:

- CUPB should work to settle the issue of radioactivity in Bathinda areas. If some reports suggesting its existence are true, then what can be done to mitigate the problem

- The issue of heavy metals in Bathinda and their mitigation should similarly be resolved.

- While respecting the freedom of individual faculty members to choose their areas of research, work on societal issues and regional problems should be encouraged. One way can be that CUPB should allocate its own resources in identified priority areas.

- More emphasis should be laid on interdisciplinary research and collaborative projects in all areas: sciences, humanities and social science.

- Natural product chemistry is another important area.

It was further discussed that CUPB should identify its core strengths and thrust areas internally through discussions with the Faculty.

Agenda 2/2015/4: Policy for publications in paid journal

Several journals these days ask for some payment for publishing research papers. Invariably, the authors ask for re-imbursement of the payment made by them. Some of these journals are of good quality and CUPB would like to encourage its faculty to publish in these, while some others are not of good quality and need to be discouraged. The matter is put up to RAC to develop some guidelines on this issue.

The RAC felt that payment for some well recognized, international journals with high impact factor and SCI and Thompson Reuter indexing could be allowed. However, CUPB may form internal committee to develop the guidelines.

Agenda 2/2015/5: Incentives for outstanding research at CUPB

CUPB has in place a policy for recognising and providing incentives for outstanding research. The important features of the policy were explained to RAC.
RAC noted the above decision of Executive Council.

Agenda 2/2015/6: Major Research Projects: Centre of Excellence Project; Project on climate change

RAC was informed that CUPB promotes interdisciplinary research by encouraging the faculty to formulate proposals from among its different centres/faculties. Recently, the Centre for Environmental Science and Technology, Centre for Human Genetics and Molecular Medicine and Centre for Chemical Sciences developed a major research proposal for UGC funding on "Health Issues in Malwa region of Punjab". Another major interdisciplinary proposal on "Designing a model to mitigate impact of climate change on urban communities using a developing university township in peri-urban Bathinda, Punjab, India, as focal point" has been submitted to IDRC, Canada. More areas for major funding need to be identified. The matter is put up for advice of Research Advisory Committee.

The following two areas were suggested for major funding:
-Agri waste management
-Repository of phytochemical reference standards with complete spectral data.

Agenda 2/2015/7: Guidelines on plagiarism

CUPB's policy to check plagiarism was explained to RAC. It was explained that depending on the severity of crime a supervisor/ teacher may be awarded any of the following punishments:

1. Warning or stoppage of increments or both.
2. Removal from CUPB.
3. Any other punishment as decided by the Executive committee on the recommendations of the relevant committee.

The members felt that a distinction should be made while awarding punishment for plagiarism in research published by a teacher independently and when he/she is a part of supervised research of a student. The level of responsibility of the teacher varies when he/she is a corresponding author of student's research and when he/she is a corresponding author of his own independent work.

Agenda 2/2015/8: Structure of Research Governance at CUPB

It was explained that CUPB has the following committees to monitor the quality of research:

(i) A university level Research Advisory Committee with external experts sets the guidelines of CUPB's research policies.

(ii) An internal Research Committee looks after the implementation of these policies and lays general guidelines.

(iii) In addition, each research project has a committee to advice on its implementation.

(iv) Also, there are advisory committees for each student.

RAC observed that CUPB should have the position of a Dean (Research) for better co-ordination of research activities.

The members complemented the University for its achievements.

The meeting ended with a vote of thanks to the chair proposed by Prof. P. Ramarao, Dean (A)

Ashis Dhar

Chairman, RAC

Central University of Punjab

Established vide act 25(2009) of Parliament

Examination Cell

Agenda Item for Academic Council & Executive Council

It is submitted that in the 6th meeting of AC the list of 190 students for the degree and list of 13 students for the award of the gold medals have been approved.

In addition to above 127 more students have completed the degrees, the list of such students is attached at **Annexure-1** and 40 more students are likely to complete degree but their result is awaited as on today and their list is attached at **Annexure-2**. Similarly the list of 10 students who have qualified for the gold medal is attached at **Annexure-3**

In view of above the academic council may kindly be requested to consider and approve:

1. The list of 127 students (attached at Annexure-1) may be approved for the award of degree in first convocation.
2. The list of 40 students (attached at Annexure-2) may be approved for the award of degree subject to their completion of the degree and declaration of the result
3. The list of 10 students (attached at Annexure-3) may be approved for the award of gold medals in first convocation.

2.12.2015

AR examinations

Controller of Examinations 2/12/15

May consider for approval as an Agenda item for forthcoming meeting of AC & EC

Vice Chancellor

Allowed
2/12/15

Annexure-1

List of students who have completed the degree

Registration No.	Name	Mother Name	Father Name	Degree	Degree which Subject	School	OWAM	CGPA Result	LG	Passing Year	Year of issued Degree	Batch	Date of Completion
UPB3/MSc/SEES/EVS/2012-13/01	Suhjeet Kaur	Paramjeet Kaur	Lakhvir Singh	Master of Science	Environmental Science and Technology	School of Environment and Earth Sciences	56	3.62	B+	2015	2015	2012-13	01.10.2015
UPB/MPh-PhD/SSS/CES/2012-13/07	Jaspreet Kaur	Davinder Kaur	Davinder Singh	Master of Philosophy	Development Economics	School of Social Sciences	75	5.50	O	2015	2015	2012-13	28.05.2015
UPB/MSc/SBAS/BIO/2012-13/05	Pawandeep Kaur	Harpreet Kaur	Balwinder Singh	Master of Science	Biosciences	School of Basic and Applied Sciences	64	4.49	A	2015	2015	2012-13	25.06.2015
UPB/MPh-PhD/SBAS/BIO/2013-14/03	Pushpendu Kundu	Malati Kundu	Madhu Sudan Kundu	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	67	4.72	A+	2015	2015	2013-14	01.10.2015
UPB/MPh-PhD/SBAS/BIO/2013-14/04	Digvijay Singh Yadav	Beena Yadav	Ram Kumar Yadav	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	70	5.05	A+	2015	2015	2013-14	01.10.2015
UPB/MPh-PhD/SBAS/BIO/2013-14/05	Kunj Bihari Gupta	Shakuntala Devi	Nand Gopal Gupta	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	70	5.05	A+	2015	2015	2013-14	20.10.2015
UPB/MPh-PhD/SBAS/BIO/2013-14/06	Aasim Majeed	Famidha Akhter	Ab Majeed Bhat	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	69	4.94	A+	2015	2015	2013-14	23.10.2015
UPB/MPh-PhD/SBAS/BIO/2013-14/09	Alka Rani	Girja Devi	Ashok Kumar	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	74	5.49	A+	2015	2015	2013-14	19.10.2015
UPB/MPh-PhD/SBAS/BIO/2013-14/11	Khem Chand Saini	Rama Devi Saini	Pratap Saini	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	64	4.49	A	2015	2015	2013-14	01.10.2015
UPB/MPh-PhD/SBAS/BIO/2013-14/13	Wahid Ul Rehman	Jamshed Begum	Mohd Rafiq	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	61	4.12	A	2015	2015	2013-14	16.10.2015
UPB/MPh-PhD/SBAS/BIO/2013-14/18	Anuradha Kumari	Shobha Devi	Khem Chand	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	61	4.12	A	2015	2015	2013-14	20.10.2015
UPB/MPh-PhD/SBAS/BIO/2013-14/19	Amandeep Singh	Jasveer Kaur	Sukhdev Singh	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	61	4.12	A	2015	2015	2013-14	26.10.2015
UPB/MPh-PhD/SLLC/CPL/2013-14/01	Jyotiprakash Nayak	Madhabi Nayak	Nityananda Nayak	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	70	5.05	A+	2015	2015	2013-14	01.09.2015

Annexure-II

CUPB/MPh-PhD/SLLC/CPL/2013-14/02	Sapanpreet Kaur	Satwant Kaur	Karamj Singh	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	72	5.27	A+	2015	2015	2013-14	19.08.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/03	Neha Sharma	Maya Sharma	Hem Prakash Sharma	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	75	5.50	O	2015	2015	2013-14	17.07.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/04	Sandeep Kaur	Gurmeet Kaur	Sukhraj Singh	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	72	5.27	A+	2015	2015	2013-14	19.08.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/05	Neha Sharma	Vijay Sharma	Hari Krishan Sharma	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	73	5.38	A+	2015	2015	2013-14	24.08.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/06	Devinder Kaur	Harbhajan Kaur	Inder Singh	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	66	4.61	A+	2015	2015	2013-14	27.07.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/07	Kavita Dhillon	Santosh Dhillon	K. S. Dhillon	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	71	5.16	A+	2015	2015	2013-14	16.07.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/08	Satyananda Maharana	Laxmipriya Maharana	Prasanna Maharana	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	67	4.72	A+	2015	2015	2013-14	02.07.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/09	Rakesh Kumar	Raj Bala	Sunder Lal	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	63	4.37	A	2015	2015	2013-14	14.08.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/10	Sartaj Ahmad Lone	Hajara Banu	Mohd Ayoub Lone	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	68	4.83	A+	2015	2015	2013-14	28.07.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/11	Shafayat Hussain Bhat	Mohmooda Begum	Mohd Hussain Bhat	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	70	5.05	A+	2015	2015	2013-14	26.06.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/12	Subhash	Mathra Devi	Duni Chand	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	68	4.83	A+	2015	2015	2013-14	27.08.2015

CUPB/MPh-PhD/SLLC/CPL/2013-14/14	Aadil Muzafar Pala	Hasina Banu	Muzafar Ahmad Pala	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	65	4.50	A+	2015	2015	2013-14	26.08.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/15	Sunny Kumar	Krishna Devi	Kundan Lal	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	70	5.05	A+	2015	2015	2013-14	12.08.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/19	Ramanpreet Kaur	Sukhpreet Kaur	Sukhdial Singh	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	70	5.05	A+	2015	2015	2013-14	19.08.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/20	Smriti Thakur	Prem Lata Thakur	Amar Chand Thakur	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	73	5.38	A+	2015	2015	2013-14	19.08.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/21	Jaswinder Kaur	Balwant Kaur	Gurjant Singh	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	67	4.72	A+	2015	2015	2013-14	01.09.2015
CUPB/MPh-PhD/SLLC/CPL/2013-14/23	Ram Ji Mishra	Gayatri Devi	Ram Charan Mishra	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	65	4.50	A+	2015	2015	2013-14	01.09.2015
CUPB/MSc/SBAS/CPS/2013-14/01	Heena Singla	Darshna Singla	Ram Parkash Singla	Master of Science	Chemical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	74	5.49	A+	2015	2015	2013-14	10.08.2015
CUPB/MSc/SBAS/CPS/2013-14/02	Rajinder Pal Mittal	Kanta Rani	Ravinder Kumar	Master of Science	Chemical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	73	5.38	A+	2015	2015	2013-14	09.09.2015
CUPB/MSc/SBAS/CPS/2013-14/03	Neha	Sunita Rani	Binder Kumar	Master of Science	Chemical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	61	4.12	A	2015	2015	2013-14	13.08.2015
CUPB/MSc/SBAS/CPS/2013-14/04	Khushboo	Silochana	Hari Singh	Master of Science	Chemical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	69	4.94	A+	2015	2015	2013-14	13.08.2015
CUPB/MSc/SBAS/CPS/2013-14/05	Harveen Kler	NirmalJit Kaur	Jaideep Singh	Master of Science	Chemical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	76	5.52	O	2015	2015	2013-14	13.08.2015

CUPB/MSc/SBAS/CPS/2013-14/06	Mansi Garg	Meena Rani	Sukhchi Kumar	Master of Science	Chemical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	70	5.05	A+	2015	2015	2013-14	13.08.2015
CUPB/MSc/SBAS/CPS/2013-14/08	Jasmin	Bindu Paul Kaur	Amrik Singh	Master of Science	Chemical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	75	5.50	O	2015	2015	2013-14	13.08.2015
CUPB/MPh-PhD/SSS/CES/2013-14/01	Javaid Ahmad Mir	Khatijah	Ab Salam Mir	Master of Philosophy	Development Economics	School of Social Sciences	64	4.49	A	2015	2015	2013-14	05.08.2015
CUPB/MPh-PhD/SSS/CES/2013-14/02	Nadeem Ahmad Bhat	Rafeeqa Banoo	Mohd Akbar Bhat	Master of Philosophy	Development Economics	School of Social Sciences	66	4.61	A+	2015	2015	2013-14	14.09.2015
CUPB/MPh-PhD/SSS/CES/2013-14/03	J Vineesh Prakash	Susanna J P	D Jayaprakash	Master of Philosophy	Development Economics	School of Social Sciences	73	5.38	A+	2015	2015	2013-14	28.07.2015
CUPB/MPh-PhD/SSS/CES/2013-14/05	Mandeep Kaur	Kiranjeet Kaur	Chamkaur Singh	Master of Philosophy	Development Economics	School of Social Sciences	72	5.27	A+	2015	2015	2013-14	27.07.2015
CUPB/MPh-PhD/SSS/CES/2013-14/06	Pushpinder Kaur	Sukhdeep Kaur	Jasveer Singh	Master of Philosophy	Development Economics	School of Social Sciences	70	5.05	A+	2015	2015	2013-14	22.05.2015
CUPB/MPh-PhD/SSS/CES/2013-14/07	Satinder Singh	Manjeet Kaur	Gurmail Singh	Master of Philosophy	Development Economics	School of Social Sciences	61	4.12	A	2015	2015	2013-14	30.07.2015
CUPB/MPh-PhD/SSS/CES/2013-14/08	Musavir Ul Habib	Shafiqa Begum	Habibullah Hajam	Master of Philosophy	Development Economics	School of Social Sciences	62	4.25	A	2015	2015	2013-14	24.09.2015
CUPB/MPh-PhD/SSS/CES/2013-14/09	Gulshan Farooq Bhat	Fatima Bano	Farooq Ahmad Bhat	Master of Philosophy	Development Economics	School of Social Sciences	63	4.37	A	2015	2015	2013-14	07.08.2015
CUPB/MPh-PhD/SSS/CES/2013-14/10	Mohd Fayaz	Sariya Begum	Mohd Hanief	Master of Philosophy	Development Economics	School of Social Sciences	67	4.72	A+	2015	2015	2013-14	28.07.2015
CUPB/MPh-PhD/SSS/CES/2013-14/11	Manpreet Kaur	Gurcharan Kaur	Baj Singh	Master of Philosophy	Development Economics	School of Social Sciences	76	5.52	O	2015	2015	2013-14	21.05.2015
CUPB/MPh-PhD/SSS/CES/2013-14/13	Ramandeep Kaur	Kulwinder Kaur	Mehal Singh	Master of Philosophy	Development Economics	School of Social Sciences	65	4.50	A+	2015	2015	2013-14	14.09.2015
CUPB/MPh-PhD/SSS/CES/2013-14/14	Harpreet Kaur	Pritpal Kaur	Pritam Singh	Master of Philosophy	Development Economics	School of Social Sciences	66	4.61	A+	2015	2015	2013-14	24.09.2015
CUPB/MPh-PhD/SSS/CES/2013-14/20	Jimmy Goyal	Madhu Goyal	Satish Goyal	Master of Philosophy	Development Economics	School of Social Sciences	68	4.83	A+	2015	2015	2013-14	24.09.2015

UPB/MPh-PhD/SSS/CES/2013-14/21	Mamandeep Kaur	Jasvinder Kaur	Bhola S	Master of Philosophy	Development Economics	School of Social Sciences	55	3.50	B+	2015	2015	2013-14	27.10.2015
UPB/MPh-PhD/SSS/CES/2013-14/22	Zahid Ul Islam Dar	Misra Banoo	Gh Mohd Dar	Master of Philosophy	Development Economics	School of Social Sciences	65	4.50	A+	2015	2015	2013-14	07.08.2015
UPB/MPh-PhD/SSS/CES/2013-14/24	Sanitha V.P.	Chandramathy	Velayudhan V.P.	Master of Philosophy	Development Economics	School of Social Sciences	67	4.72	A+	2015	2015	2013-14	03.08.2015
UPB/MPh-PhD/SSS/CES/2013-14/25	Noushad A.P.	Kadeeja	Muhammed A.P.	Master of Philosophy	Development Economics	School of Social Sciences	62	4.25	A	2015	2015	2013-14	13.08.2015
UPB/MPh-PhD/SEES/EVS/2013-14/03	Shilpa Sharma	Suraksha Kumari	Jyoti Parkash	Master of Philosophy	Environmental Science and Technology	School of Environment and Earth Sciences	78	5.56	O	2015	2015	2013-14	30.04.2015
UPB/MPh-PhD/SEES/EVS/2013-14/04	Akanksha Bhardwaj	Raksha Bhardwaj	Satish Bhardwaj	Master of Philosophy	Environmental Science and Technology	School of Environment and Earth Sciences	76	5.52	O	2015	2015	2013-14	12.06.2015
UPB/MPh-PhD/SEES/EVS/2013-14/07	Mudasir Youssouf	Fahmeeda Bano	Mohd Youssouf Malik	Master of Philosophy	Environmental Science and Technology	School of Environment and Earth Sciences	66	4.61	A+	2015	2015	2013-14	29.09.2015
UPB/MPh-PhD/SEES/EVS/2013-14/11	Arun Kalia	Veena Devi	Ram Nath Kalia	Master of Philosophy	Environmental Science and Technology	School of Environment and Earth Sciences	62	4.25	A	2015	2015	2013-14	20.10.2015
UPB/MPh-PhD/SEES/EVS/2013-14/15	Afzal Ansari	Zulekha Begam	Samiullah Ansari	Master of Philosophy	Environmental Science and Technology	School of Environment and Earth Sciences	57	3.75	B+	2015	2015	2013-14	10.08.2015
UPB/MPh-PhD/SEES/EVS/2013-14/17	Naseer Ahmad	Mymoona Bano	Mohd Yousuf Bhat	Master of Philosophy	Environmental Science and Technology	School of Environment and Earth Sciences	67	4.72	A+	2015	2015	2013-14	22.06.2015
UPB/MSc/SEES/EVS/2013-14/01	Gagandeep Kaur	Kulwant Kaur	Sukhpal Singh	Master of Science	Environmental Science and Technology	School of Environment and Earth Sciences	73	5.38	A+	2015	2015	2013-14	19.08.2015
UPB/MSc/SEES/EVS/2013-14/03	Nidhi Sharma	Mamta Sharma	Pardeep Kumar	Master of Science	Environmental Science and Technology	School of Environment and Earth Sciences	66	4.61	A+	2015	2015	2013-14	29.09.2015
UPB/MSc/SEES/EVS/2013-14/04	Rajveer Kaur	Rajinder Kaur	Jagtar Singh	Master of Science	Environmental Science and Technology	School of Environment and Earth Sciences	75	5.50	O	2015	2015	2013-14	31.07.2015
UPB/MSc/SEES/EVS/2013-14/05	Preetinder Kaur	Opinder Kaur	Kulwinder Singh	Master of Science	Environmental Science and Technology	School of Environment and Earth Sciences	61	4.12	A	2015	2015	2013-14	20.08.2015
UPB/MPharm-PC/SBAS/CPS/2013-14/01	Archana Kashyap	Sandhya Kashyap	Hari Ram Kashyap	Master of Pharmacy	Pharmaceutical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	70	5.05	A+	2015	2015	2013-14	01.09.2015

CUPB/MPharm-MC/SBAS/CPS/2013-14/02	Sapna Kumari	Santosh Kumari	Naresh Kumar	Master of Pharmacy	Pharmaceutical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	73	5.38	A+	2015	2015	2013-14	12.08.2015
CUPB/MPharm-MC/SBAS/CPS/2013-14/03	Jagpreet Singh	Sukhpal Kaur	Mithu Singh	Master of Pharmacy	Pharmaceutical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	70	5.05	A+	2015	2015	2013-14	09.09.2015
CUPB/MPharm-MC/SBAS/CPS/2013-14/04	Shivani Sharma	Meena Sharma	Ravinder Kumar Sharma	Master of Pharmacy	Pharmaceutical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	60	4.00	A	2015	2015	2013-14	11.08.2015
CUPB/MPharm-MC/SBAS/CPS/2013-14/05	Bhupinder Kumar	Kanta Rani	Ravinder Kumar	Master of Pharmacy	Pharmaceutical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	75	5.50	O	2015	2015	2013-14	10.08.2015
CUPB/MPharm-MC/SBAS/CPS/2013-14/06	Pankaj Kumar Singh	Jagesh Singh	Kamendra Singh	Master of Pharmacy	Pharmaceutical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	74	5.49	A+	2015	2015	2013-14	07.08.2015
CUPB/MPharm-MC/SBAS/CPS/2013-14/07	Vivek Prakash	Kamala Devi	Hiraman Prasad	Master of Pharmacy	Pharmaceutical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	61	4.12	A	2015	2015	2013-14	12.08.2015
CUPB/MPharm-MC/SBAS/CPS/2013-14/08	Himanshu Nayyar	Parveen Nayyar	Rakesh Kumar Nayyar	Master of Pharmacy	Pharmaceutical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	65	4.50	A+	2015	2015	2013-14	14.09.2015
CUPB/MPharm-MC/SBAS/CPS/2013-14/09	Anuradha Thakur	Suman Devi	Kapoor Singh	Master of Pharmacy	Pharmaceutical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	69	4.94	A+	2015	2015	2013-14	12.08.2015
CUPB/MPharm-MC/SBAS/CPS/2013-14/10	Shelly Pathania	Urmila Pathania	Birbal Singh Pathania	Master of Pharmacy	Pharmaceutical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	71	5.16	A+	2015	2015	2013-14	10.08.2015
CUPB/MPh-PHD/SGR/SCA/2013-14/02	Niraj Kumar	Pratima Devi	Ram Suresh Roy	Master of Philosophy	South and Central Asian Studies	School of Global Relations	64	4.49	A	2015	2015	2013-14	27.07.2015
CUPB/MPh-PHD/SGR/SCA/2013-14/05	Abdul Rouf Bhat	Hafiza Banu	Nazir Ahmad Bhat	Master of Philosophy	South and Central Asian Studies	School of Global Relations	66	4.61	A+	2015	2015	2013-14	27.07.2015
CUPB/MPh-PHD/SGR/SCA/2013-14/07	Shabaz Hussain Shah	Mehmooda	Mohammad Maqbool Shah	Master of Philosophy	South and Central Asian Studies	School of Global Relations	68	4.83	A+	2015	2015	2013-14	27.07.2015

CUPB/MPh-PhD/SGR/SCA/2013-14/11	Amanpreet Kaur	Mohinder Kaur	Ranjit S[illegible]	Master of Philosophy	South and Central Asian Studies	School of Global Relations	68	4.83	A+	2015	2015	2013-14	06.07.2015
CUPB/MPh-PhD/SGR/SCA/2013-14/12	Shiv Kumar	Sawarna Devi	Mehar Singh	Master of Philosophy	South and Central Asian Studies	School of Global Relations	66	4.61	A+	2015	2015	2013-14	16.07.2015
CUPB/MPh-PhD/SGR/SCA/2013-14/13	Kulcip Singh	Gulab Kaur	Meva Singh	Master of Philosophy	South and Central Asian Studies	School of Global Relations	64	4.49	A	2015	2015	2013-14	02.06.2015
CUPB/MPh-PhD/SGR/SCA/2013-14/18	Amandeep Singh	Sarbjeet Kaur	Gurmej Singh	Master of Philosophy	South and Central Asian Studies	School of Global Relations	61	4.12	A	2015	2015	2013-14	27.07.2015
CUPB/MPh-PhD/SGR/SCA/2013-14/19	Noushadali K	Ayishabi K	Abdulkareem K	Master of Philosophy	South and Central Asian Studies	School of Global Relations	70	5.05	A+	2015	2015	2013-14	26.05.2015
CUPB/MPh-PhD/SGR/SCA/2013-14/23	Yassir Nazir	Shamalla Begum	Nazir Ahmed	Master of Philosophy	South and Central Asian Studies	School of Global Relations	69	4.94	A+	2015	2015	2013-14	06.07.2015
CUPB/MPh-PhD/SGR/SCA/2013-14/24	Sameer Ahmad Bhat	Gulshanah Banoo	Ab Rahman Bhat	Master of Philosophy	South and Central Asian Studies	School of Global Relations	61	4.12	A	2015	2015	2013-14	06.07.2015
CUPB/MPh/SBAS/PMS/2013-14/01	Ajay Kumar	Chanchla Devi	Gian Chand	Master of Philosophy	Physics	School of Basic and Applied Sciences	71	5.16	A+	2015	2015	2013-14	04.06.2015
CUPB/MPh/SBAS/PMS/2013-14/03	Deep Kumar	Bimla Devi	Palphu Ram	Master of Philosophy	Physics	School of Basic and Applied Sciences	65	4.50	A+	2015	2015	2013-14	23.06.2015
CUPB/MPh/SBAS/PMS/2013-14/04	Prem Pankaj	Kamla Kaushal	Sukh Ram	Master of Philosophy	Physics	School of Basic and Applied Sciences	63	4.37	A	2015	2015	2013-14	11.05.2015
CUPB/MPh/SBAS/PMS/2013-14/05	Neha Bhardwaj	Kusem Bhardwaj	Prem Kumar Bhardwaj	Master of Philosophy	Physics	School of Basic and Applied Sciences	76	5.52	O	2015	2015	2013-14	04.06.2015
CUPB/MPh/SBAS/PMS/2013-14/06	Gaurav Jamwal	Byasa Devi	Tara Chand	Master of Philosophy	Physics	School of Basic and Applied Sciences	74	5.49	A+	2015	2015	2013-14	19.05.2015
CUPB/MPh/SBAS/PMS/2013-14/07	Surinder Kaur	Manjit Kaur	Bhag Singh	Master of Philosophy	Physics	School of Basic and Applied Sciences	76	5.52	O	2015	2015	2013-14	05.05.2015
CUPB/MPh/SBAS/PMS/2013-14/08	Mohd Sadiq	Amina Bano	Mohd Ibrahim	Master of Philosophy	Physics	School of Basic and Applied Sciences	62	4.25	A	2015	2015	2013-14	23.06.2015
CUPB/MPh/SBAS/PMS/2013-14/09	Reena Rani	Asha Rani	Satnam Singh	Master of Philosophy	Physics	School of Basic and Applied Sciences	63	4.37	A	2015	2015	2013-14	04.06.2015

CUPB/MPh/SBAS/PMS/2013-14/10	Ritesh Kumar	Maya Devi	Ramesh Kumar	Master of Philosophy	Physics	School of Basic and Applied Sciences	63	4.37	A	2015	2015	2013-14	26.10.2015
CUPB/MSc/SBAS/PMS/2013-14/01	Gaurav Kumar Yogesh	Poonam Yogesh	Surendra Kumar Yogesh	Master of Science	Physics (Nanophysics)	School of Basic and Applied Sciences	75	5.52	O	2015	2015	2013-14	28.08.2015
CUPB/MSc/SBAS/PMS/2013-14/02	Sansar Chand	Prakasho Devi	Batan Chand	Master of Science	Physics (Nanophysics)	School of Basic and Applied Sciences	75	5.50	O	2015	2015	2013-14	07.09.2015
CUPB/MSc/SBAS/PMS/2013-14/03	Shivam Shukla	Nisha Shukla	Akhilesh Chandra Shukla	Master of Science	Physics (Nanophysics)	School of Basic and Applied Sciences	77	5.54	O	2015	2015	2013-14	01.09.2015
CUPB/MSc/SBAS/PMS/2013-14/04	Ankit Gakkhar	Seema Gakkhar	Jai Kishan Gakkhar	Master of Science	Physics (Nanophysics)	School of Basic and Applied Sciences	65	4.50	A+	2015	2015	2013-14	01.09.2015
CUPB/MSc/SBAS/PMS/2013-14/05	Sweety Sharma	Geeta Rani	Ashwani Kumar	Master of Science	Physics (Nanophysics)	School of Basic and Applied Sciences	64	4.49	A	2015	2015	2013-14	18.08.2015
CUPB/MSc/SBAS/PMS/2013-14/06	Sachin Saini	Santosh Devi	Jagan Nath	Master of Science	Physics (Nanophysics)	School of Basic and Applied Sciences	58	3.87	B+	2015	2015	2013-14	01.09.2015
CUPB/MSc/SBAS/PMS/2013-14/07	Anil Arya	Darshna Devi	Prithvi Singh	Master of Science	Physics (Nanophysics)	School of Basic and Applied Sciences	73	5.38	A+	2015	2015	2013-14	18.08.2015
CUPB/MTech/SET/CST/2013-14/01	Amita Get	Indu Devi	Vinod Kumar	Master of Technology	Computer Science and Technology	School of Engineering and Technology	70	5.05	A+	2015	2015	2013-14	11.08.2015
CUPB/MTech/SET/CST/2013-14/02	Ashish Kumar	Soor Sati	Baij Nath	Master of Technology	Computer Science and Technology	School of Engineering and Technology	59	3.99	B+	2015	2015	2013-14	14.09.2015
CUPB/MTech/SET/CST/2013-14/04	Dharmveer	Anita	Suresh Kumar	Master of Technology	Computer Science and Technology	School of Engineering and Technology	69	4.94	A+	2015	2015	2013-14	17.09.2015
CUPB/MTech/SET/CST/2013-14/05	Gaurav Kumar	Meena Kumari	Ramjee Prasad Sah	Master of Technology	Computer Science and Technology	School of Engineering and Technology	65	4.50	A+	2015	2015	2013-14	25.08.2015
CUPB/MTech/SET/CST/2013-14/07	Komal Rani	Neelam Rani	Ashok Garg	Master of Technology	Computer Science and Technology	School of Engineering and Technology	77	5.54	O	2015	2015	2013-14	01.09.2015
CUPB/MTech/SET/CST/2013-14/09	Meenu Singh	Jayawati Devi	Horan Pal Singh	Master of Technology	Computer Science and Technology	School of Engineering and Technology	67	4.72	A+	2015	2015	2013-14	01.09.2015
CUPB/MTech/SET/CST/2013-14/10	Pankaj Kumar	Jai Mala Devi	Dashrath Mahto	Master of Technology	Computer Science and Technology	School of Engineering and Technology	74	5.49	A+	2015	2015	2013-14	14.09.2015

CUPB/MTech/SET/CST/2013-14/11	Rajeev Kumar	Mina Devi	Upendra Bhagat	Master of Technology	Computer Science and Technology	School of Engineering and Technology	76	5.52	O	2015	2015	2013-14	25.08.2015
CUPB/MTech/SET/CST/2013-14/12	Rajshree Purohit	Jyoti Bala Purohit	Vijay Shankar Purohit	Master of Technology	Computer Science and Technology	School of Engineering and Technology	66	4.61	A+	2015	2015	2013-14	01.09.2015
CUPB/MTech/SET/CST/2013-14/13	Rohit Goyal	Suresh Rani Goyal	Ashok Kumar Goyal	Master of Technology	Computer Science and Technology	School of Engineering and Technology	67	4.72	A+	2015	2015	2013-14	17.09.2015
CUPB/MTech/SET/CST/2013-14/18	Suchismita Mahato	Gopa Mahato	Lochan Mahato	Master of Technology	Computer Science and Technology	School of Engineering and Technology	73	5.38	A+	2015	2015	2013-14	11.08.2015
CUPB/MTech/SET/CST/2013-14/19	Sunil Kumar	Nirmala Devi	Prehlad Rai	Master of Technology	Computer Science and Technology	School of Engineering and Technology	78	5.56	O	2015	2015	2013-14	20.10.2015
CUPB/MTech/SET/CST/2013-14/20	Vicky Kumar	Shanti Devi	Hanuman Prasad	Master of Technology	Computer Science and Technology	School of Engineering and Technology	76	5.52	O	2015	2015	2013-14	11.08.2015
CUPB/MTech/SET/CST/2013-14/22	Ashok Kumar	Chunni Devi	Bhawar Lal	Master of Technology	Computer Science and Technology	School of Engineering and Technology	66	4.61	A+	2015	2015	2013-14	25.08.2015
CUPB/MTech-S/SET/CST/2013-14/01	Harsh Kishore Mishra	Shakuntala Mishra	Brij Kishore Mishra	Master of Technology	Cyber Security	School of Engineering and Technology	71	5.16	A+	2015	2015	2013-14	28.09.2015
CUPB/MTech-S/SET/CST/2013-14/02	Ravinder Saini	Satbir Kaur	Harmesh Chand Saini	Master of Technology	Cyber Security	School of Engineering and Technology	77	5.54	O	2015	2015	2013-14	13.10.2015
CUPB/MTech-S/SET/CST/2013-14/03	Prabhjot Singh	Jasvir Kaur	Varinderpal Singh	Master of Technology	Cyber Security	School of Engineering and Technology	77	5.54	O	2015	2015	2013-14	08.08.2015
CUPB/MTech-S/SET/CST/2013-14/05	Manmeet Singh	Balwinder Kaur	Jarnail Singh	Master of Technology	Cyber Security	School of Engineering and Technology	76	5.52	O	2015	2015	2013-14	30.10.2015
CUPB/MTech-S/SET/CST/2013-14/06	Ashish Aggarwal	Alka Aggarwal	Vipan Kumar	Master of Technology	Cyber Security	School of Engineering and Technology	67	4.72	A+	2015	2015	2013-14	09.09.2015
CUPB/MTech-S/SET/CST/2013-14/07	Rinku	Darshna	Dharmpal	Master of Technology	Cyber Security	School of Engineering and Technology	73	5.38	A+	2015	2015	2013-14	26.08.2015
CUPB/MTech-S/SET/CST/2013-14/12	Srishti Yadav	Sudesh Yadav	Ramesh Kumar Yadav	Master of Technology	Cyber Security	School of Engineering and Technology	69	4.94	A+	2015	2015	2013-14	15.09.2015
CUPB/MTech-S/SET/CST/2013-14/14	Shabnam Sharma	Sushma	Milap Chand	Master of Technology	Cyber Security	School of Engineering and Technology	71	5.16	A+	2015	2015	2013-14	01.10.2015

CUPB/MTech-CS/SET/CST/2013-14/15	Sanju	Shobha Rani	Bharat Bhusha...	Master of Technology	Cyber Security	School of Engineering and Technology	67	4.72	A+	2015	2015	2013-14	01.10.2015
CUPB/MTech-CS/SET/CST/2013-14/17	Gagandeep*	Godawari Devi	Prem Lal	Master of Technology	Cyber Security	School of Engineering and Technology	60	4.00	A	2015	2015	2013-14	09.09.2015
CUPB/LLM/SLSG/CEL/2014-15/02	Manavi	Nisha	Prem Bhushan	Master of Laws	Environmental Law	School of Legal Studies and Governance	68	4.83	A+	2015	2015	2014-15	31.07.2015
CUPB/LLM/SLSG/CEL/2014-15/03	Rohit Choudhary	Balesh	Rajpal Singh	Master of Laws	Environmental Law	School of Legal Studies and Governance	64	4.49	A	2015	2015	2014-15	17.07.2015
CUPB/LLM/SLSG/CEL/2014-15/05	Alankar Arora	Kanchan Lata Arora	Hans Raj Arora	Master of Laws	Environmental Law	School of Legal Studies and Governance	64	4.49	A	2015	2015	2014-15	21.07.2015

Annexure-2 Students whose final results are awaited

Registration No.	Name	Mother Name	Father Name	Degree	Degree which Subject	School	OWAM	CGPA Result	LG	Batch	Date of Completion
UPB/MPh-PhD/SBAS/BIO/2013-14/02	Sumandeep Juneja	Mandeep Juneja	Mohanjit Singh Juneja	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	72	5.27	A+	2013-14	Viva Pending
UPB/MPh-PhD/SBAS/BIO/2013-14/07	Iqbal Gill	Surinder Kaur Gill	Gurmeet Singh Gill	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	68	4.83	A+	2013-14	Viva Pending
UPB/MPh-PhD/SBAS/BIO/2013-14/10	Sukhchain Kaur	Bhinder Kaur	Raj Singh	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	65	4.50	A+	2013-14	Viva Pending
UPB/MPh-PhD/SBAS/BIO/2013-14/12	Rashpal Kumar	Baljeet Kaur	Dhanpat	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	64	4.49	A	2013-14	Viva Pending
UPB/MPh-PhD/SBAS/BIO/2013-14/14	Sonu Kumar Gupta	Indrani Devi	Shashi Bhushan Prasad	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	59	3.99	B+	2013-14	Viva Pending
UPB/MPh-PhD/SBAS/BIO/2013-14/15	Ravindra Kumar	Vimla Devi	Kamal Maurya	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	62	4.25	A	2013-14	Viva Pending
UPB/MPh-PhD/SBAS/BIO/2013-14/16	Shokit Amin Paswal	Razia Bi	Mohd Ibrahim Paswal	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	64	4.49	A	2013-14	Viva Pending
UPB/MPh-PhD/SBAS/BIO/2013-14/17	Priyanka Singh	Manjul Prabha	Dhirendra Kumar Singh	Master of Philosophy	Biosciences	School of Basic and Applied Sciences	76	5.52	O	2013-14	Viva Pending
UPB/MSc-BIO/SBAS/BIO/2013-14/01	Meenu Rani	Veena Devi	Ram Lalit	Master of Science	Biosciences	School of Basic and Applied Sciences	77	5.54	O	2013-14	Viva Pending
UPB/MSc-BIO/SBAS/BIO/2013-14/03	Muzamil Ahmad Rather	Maryama Bano	Hamidullah Rather	Master of Science	Biosciences	School of Basic and Applied Sciences	72	5.27	A+	2013-14	Viva Pending
UPB/MSc-BIO/SBAS/BIO/2013-14/04	Preeti Dubey	Chakrawati Dubey	Rohini Nand Dubey	Master of Science	Biosciences	School of Basic and Applied Sciences	76	5.52	O	2013-14	Viva Pending
UPB/MSc-BIO/SBAS/BIO/2013-14/05	Nisha Bansal	Upma Bansal	Vijay Kumar Bansal	Master of Science	Biosciences	School of Basic and Applied Sciences	69	4.94	A+	2013-14	Viva Pending
UPB/MSc-BIO/SBAS/BIO/2013-14/06	Sheffaly Singla	Anita Rani	Jiwan Chand	Master of Science	Biosciences	School of Basic and Applied Sciences	65	4.50	A+	2013-14	Viva Pending
UPB/MSc-BIO/SBAS/BIO/2013-14/08	Sanju Kumari	Meena Devi	Sudeshwar Prasad	Master of Science	Biosciences	School of Basic and Applied Sciences	71	5.16	A+	2013-14	Viva Pending
UPB/MSc-MG/SBAS/BIO/2013-14/02	Supandeep Kaur	Harpal Kaur	Bhupinder Singh	Master of Science	Molecular Genetics	School of Basic and Applied Sciences	71	5.16	A+	2013-14	Viva Pending
UPB/MSc-MG/SBAS/BIO/2013-14/03	Nidhi Dadheech	Gayatree Dadheech	Vijay Kumar Dadheech	Master of Science	Molecular Genetics	School of Basic and Applied Sciences	67	4.72	A+	2013-14	Viva Pending
UPB/MPh-PhD/SLLC/CPL/2013-14/02	Geetika Garg	Hira Devi Garg	Jaipal Garg	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	68	4.83	A+	2013-14	Viva Pending
UPB/MPh-PhD/SSS/CES/2013-14/12	Archana Mishra	Aruna Mishra	Ramesh Kumar Mishra	Master of Philosophy	Development Economics	School of Social Sciences	70	5.05	A+	2013-14	Viva Pending
UPB/MPh-PhD/SSS/CES/2013-14/15	Bishwajeet Prakash	Usha Prakash	Lekh Nath Saha Prakash	Master of Philosophy	Development Economics	School of Social Sciences	62	4.25	A	2013-14	Viva Pending
UPB/MPh-PhD/SSS/CES/2013-14/17	Parmjeet Kaur	Reshma Devi	Mann Singh	Master of Philosophy	Development Economics	School of Social Sciences	60	4.00	A	2013-14	Viva Pending

/MPh-PhD/SSS/CES/2013-	Manpreet Kaur	Amarjeet Kaur	Bhola Singh	Master of Philosophy	Development Economics	School of Social Sciences	57	3.75	B+	2013-14	Viva Pending
/MPh-PhD/SSS/CES/2013-	Towseef Ahmad Shan	Dilshada Banoo	Ab Rashid Shan	Master of Philosophy	Development Economics	School of Social Sciences	56	3.62	B+	2013-14	Viva Pending
/MPh-PhD/SEES/EVS/2013-	Amit Kumar Chauhan	Santosh Devi	Jai Bhagwan Singh	Master of Philosophy	Environmental Science and Technology	School of Environment and Earth Sciences	64	4.49	A	2013-14	Viva Pending
/MPh-PhD/SEES/EVS/2013-	Radheshyam Yadav	Viddyawati Devi	Ram Chandra Yadav	Master of Philosophy	Environmental Science and Technology	School of Environment and Earth Sciences	62	4.25	A	2013-14	Viva Pending
/MPh-PhD/SEES/EVS/2013-	Gini Rani	Kaushalya Devi	Ram Bhagwan Paswan	Master of Philosophy	Environmental Science and Technology	School of Environment and Earth Sciences	61	4.12	A	2013-14	Viva Pending
/MPh-PhD/SEES/EVS/2013-	Vijay Jaswal	Sakina Devi	Sadhu Ram	Master of Philosophy	Environmental Science and Technology	School of Environment and Earth Sciences	66	4.61	A+	2013-14	Viva Pending
/MPh-PhD/SEES/EVS/2013-	Sneh Lata	Ram Jagi Devi	Ram Niranjan Singh	Master of Philosophy	Environmental Science and Technology	School of Environment and Earth Sciences	58	3.87	B+	2013-14	Viva Pending
/MA-P/SLLC/CPL/2013-14/01	Rajpal Kaur	Mandeep Kaur	Jangir Singh	Master of Arts (Hons.)	Punjabi and Comparative Literature	School of Languages, Literature and Culture	74	5.49	A+	2013-14	Viva Pending
/MA-P/SLLC/CPL/2013-14/02	Mandeep Singh	Sukhjeet Kaur	Guraditta Singh	Master of Arts (Hons.)	Punjabi and Comparative Literature	School of Languages, Literature and Culture	73	5.38	A+	2013-14	Viva Pending
/MA-P/SLLC/CPL/2013-14/03	Amanpreet Kaur	Shinderpal Kaur	Rachhpal Singh	Master of Arts (Hons.)	Punjabi and Comparative Literature	School of Languages, Literature and Culture	71	5.16	A+	2013-14	Viva Pending
/MA-P/SLLC/CPL/2013-14/04	Raghvir Singh	Karamjeet Kaur	Guranditta Singh	Master of Arts (Hons.)	Punjabi and Comparative Literature	School of Languages, Literature and Culture	69	4.94	A+	2013-14	Viva Pending
/MA-P/SLLC/CPL/2013-14/05	Mandeep Singh	Sarbjeet Kaur	Inder Singh	Master of Arts (Hons.)	Punjabi and Comparative Literature	School of Languages, Literature and Culture	58	3.87	B+	2013-14	Viva Pending
/MPh-PhD/SGR/SCA/2013-	Raghavendra Pratap Kushwaha	Nirmala Devi	Bhagirath Kushwaha	Master of Philosophy	South and Central Asian Studies	School of Global Relations	60	4.00	A	2013-14	Viva Pending
/MTech/SET/CST/2013-14/14	Sanjay Meena	Vishnu Meena	Om Prakash Meena	Master of Technology	Computer Science and Technology	School of Engineering and Technology	54	3.49	B	2013-14	Viva Pending
/MTech/SET/CST/2013-14/15	Saurav Kumar Jindal	Mithlesh Jindal	Dinesh Kumar Jindal	Master of Technology	Computer Science and Technology	School of Engineering and Technology	59	3.99	B+	2013-14	Viva Pending

[illegible]/MTech/SET/CST/2013-14/21	Siddharth Kumar	Amita Kumari	Pravin Kumar	Master of Technology	Computer Science and Technology	School of Engineering and Technology	64	4.49	A	2013-14	Viva Pending
[illegible]/MTech-CS/SET/CST/2013-[illegible]	Hemant Kumar	Kamlesh Kumari	Inder Pal	Master of Technology	Cyber Security	School of Engineering and Technology	54	3.49	B	2013-14	Viva Pending
[illegible]/MTech-CS/SET/CST/2013-[illegible]13	Avinash Kumar Gupta	Asha Devi	Ambika Prasad Gupta	Master of Technology	Cyber Security	School of Engineering and Technology	63	4.37	A	2013-14	Viva Pending
[illegible]/MTech-CS/SET/CST/2013-[illegible]16	Satyendra Mathey	Vijay Laxmi	Rajendra Mathey	Master of Technology	Cyber Security	School of Engineering and Technology	58	3.87	B+	2013-14	Viva Pending
[illegible]/MSc/SEES/EST/2012-13/02	Rajbinder Singh Chahal	Surinderpal Kaur	Sukhbans Singh Chahal	Master of Science	Environmental Science and Technology	School of Environment and Earth Sciences	62	4.25	A	2012-13	Result notification Pending

Annexure-3

Central university of Punjab

Students who Eligible for award of Gold Medal in 2013-14 Batch

Sr.No	Registration No.	Name	Mother Name	Father Name	Degree	Degree which Subject	School	CGPA Result	Passing Year*	Year of issued Degree*	Batch
1	CUPB/MSc-BIO/SBAS/BIO/2013-14/01	Meenu Rani	Veena Devi	Ram Lalit	Master of Science	Biosciences	School of Basic and Applied Sciences	5.54	2015	2015	2013-14
2	CUPB/MPh-PhD/S.LC/CPL/2013-14/03	Neha Sharma	Maya Sharma	Hem Prakash Sharma	Master of Philosophy	Comparative Literature	School of Languages, Literature and Culture	5.50	2015	2015	2013-14
3	CUPB/MSc/SBAS/CPS/2013-14/05	Harveen Kler	NirmalJit Kaur	Jaideep Singh	Master of Science	Chemical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	5.52	2015	2015	2013-14
4	CUPB/MPh-PhD/SSS/CES/2013-14/11	Manpreet Kaur	Gurcharan Kaur	Baj Singh	Master of Philosophy	Development Economics	School of Social Sciences	5.52	2015	2015	2013-14
5	CUPB/MPh-PhD/SEES/EVS/2013-14/03	Shilpa Sharma	Suraksha Kumari	Jyoti Parkash	Master of Philosophy	Environmental Science and Technology	School of Environment And Earth Sciences	5.56	2015	2015	2013-14
6	CUPB/MSc/SEES/EVS/2013-14/04	Rajveer Kaur	Rajinder Kaur	Jagtar Singh	Master of Science	Environmental Science and Technology	School of Environment And Earth Sciences	5.50	2015	2015	2013-14
7	CUPB/MPharm-MC/SBAS/CPS/2013-14/05	Bhupinder Kumar	Kanta Rani	Ravinder Kumar	Master of Pharmacy	Pharmaceutical Sciences (Medicinal Chemistry)	School of Basic and Applied Sciences	5.50	2015	2015	2013-14
8	CUPB/MPh/SBAS/PMS/2013-14/07	Surinder Kaur	Manjit Kaur	Bhag Singh	Master of Philosophy	Physics	School of Basic and Applied Sciences	5.52	2015	2015	2013-14

Annexure 1.9.15

9	CUPB/MSc/SBAS/PMS/2013-14/03	Shivam Shukla	Nisha Shukla	Akhilesh Chandra Shukla	Master of Science	Physics (Nanophysics)	School of Basic and Applied Sciences	5.54	2015	2015	2013-14
10	CUPB/MTech/SET/CST/2013-14/19	Sunil Kumar	Nirmala Devi	Prehlad Rai	Master of Technology	Computer Science and Technology	School of Engineering and Technology	5.56	2015	2015	2013-14

Examination Cell

Central University of Punjab
Established vide act 25(2009) of Parliament

Ref. No. CUPB/CCOE/15/746 Date: 16.09.2015

Annexure 19.85

Sub: Regarding submission of Ph.D. thesis.

It is submitted that first Ph.D. thesis is ready for submission. The format/specifications for preparing the dissertation/thesis by students of CUP is attached at annexure-1. This format was approved on 23-02-2012 by the then Vice Chancellor.

In the format, it has been mentioned (at page no. 4) that afthe completion of all the prescribed requirements of programme, the student will submit the two spiral bound copies of the dissertation. But as per rules and regulations of Ph.D., the thesis shall be examined by three external examiners; one of these shall be from abroad, therefore, as discussed, following modification may be done :

1. After completion of all the prescribed requirements of the Ph.D. programme, the students are required to submit four **hard bound** copies as per prescribed format.
2. To save paper and environment, the printing should be done on both sides of paper
3. To make the differentiation of thesis following color codes may be used:

S.N.	Progarmme	Color Code
1	Ph.D.(Science)	Black with golden letters
2	Ph.D.(Humanities)	Red with golden letters
3	Ph.D.(Commerce)	Navy blue with golden letters
4	M.Phil.(Science)	Brown with silver letters
5	M.Phil.(Humanities)	Royal blue with silver letters
6	M.Pharm.	Olive green with silver letters
7	M.Tech.	Maroon with silver letters
8	LL.M	Dark grey with silver letters
9	M.Sc.	Light blue with black letters
10	MA	Beige with black letters
11	M.Ed.	Light yellow with black letters

Submitted for consideration and approval please.

16.09.2015
Assistant registrar

16/9/15
Controller of examinations

DAR 17/9/15

Put up for approval.

23/9/2015

Hon'ble Vice Chancellor - In anticipation of the approval of AC allowed.

Color codes of thesis/dissertations

S.N.	Progarmme	Color Code
1	Ph.D.(Science)	Black with golden letters
2	Ph.D.(Humanities)	Red with golden letters
3	Ph.D.(Commerce)	Navy blue with golden letters
4	M.Phil.(Science)	Brown with silver letters
5	M.Phil.(Humanities)	Royal blue with silver letters
6	M.Pharm.	Olive green with silver letters
7	M.Tech.	Maroon with silver letters
8	LLM	Dark grey with silver letters
9	M.Sc.	Light blue with black letters
10	MA	Beige with black letters
11	M.Ed.	Light yellow with black letters

Components of dissertation/thesis

Every post graduate student will submit a dissertation/thesis on the compulsory research work carried out by him/her. The dissertation/thesis will have components given in the Annexure I and following instructions must be followed while preparing the dissertation/thesis:

1. Preliminary pages

The preliminary pages must include the title page, the certificates, acknowledgements, abstract, table of contents, list of tables, list of figures, list of appendices and list of abbreviations used in the dissertation/thesis. These should be numbered using lower case Roman numerals (i, ii, iii,...).

a. Title page

The title page should be printed exactly in accordance with the sample [Annexure II]. The date appearing on the title page must be the year in which the dissertation/thesis is submitted.

b. Certificates

Certificates regarding originality of the work from supervisor (s) and student should be included in the preliminary pages. These certificates must be included on two separate pages exactly as given in Annexure III and IV.

c. Acknowledgements

Acknowledgment (s), if any should be brief, not exceeding one page.

d. Abstract

The abstract should not exceed two (2) pages, it has to be typed single space in the format given in Annexure V and it must be signed both by the student and the supervisor.

e. Table of contents

Except the title page, certificates, acknowledgements and abstract, all other major divisions of the dissertation/thesis should be listed in the table of contents. These divisions and sub-divisions, if any, must agree in wording and style with the text. List of tables, list of figures, list of appendices and list of abbreviations should be typed separately on a page in the same style as for the text.

2. Main body of the dissertation/thesis text

The detailed organization of the text will vary with dissertation/thesis in different subjects, but a consistent style must be followed. In general, the text is divided in to various parts as per Annexure-I. The text of the dissertation/thesis may also include certain materials such as tables,illustrations, photographs, chemical and mathematical formulae and footnotes. The text may be arranged under primary, secondary, tertiary (and so on) titles and subtitles.

a. Tables

Tables should be self-explanatory, headings and the column/row entries should be clearly related. Tables less than half a page may be centered on the pages with text above and below. All tables should be numbered with Arabic numerals (1,2,3, ...) consecutively throughout the thesis

b. Formulae

Mathematical and chemical formulae should be carefully done on computer. Complex mathematical formulae of two or more lines should not be included in text lines, but these should be placed in the proper position in the centre of the page between lines of text.

c. Scientific names

Give technical name of living organisms in full at the first mention, e.g. *Triticum aestivum*(L.). Thereafter, abbreviate them in the text, e.g. *T. aestivum* (L.).

d. Abbreviations of weights, measures calendar and time

The standard abbreviations of weights, measures, calendar and time should be followedas given in Annexure VI.

e. Illustrations

Illustrations used in the dissertation/thesis must appear in all the copies at appropriate places.

f. References

I. For science subjects list all the references in alphabetical order in APA style.

II. For languages, literature, culture and social sciences list all the references in alphabetical order in MLA style.

III. When there is only single author, arrange references year wise.

IV. In case of two or more authors, see the second author and arrange references alphabetically. When first and second authors are the same then see the third author and arrange references alphabetically.

V. In alphabetically arranged references, references with two or more with same authors/ surname are to be arranged year wise.

VI. For details of reference writing follow instructions attached as Annexure-IX.

3. Instructions of typing and printing of thesis/dissertation

a. Paper quality

The original dissertation/thesis as well as the photocopies should be prepared on a high quality white paper of A4 size. All pages must have at least 4 cm margin on the left, 1.5 cm on the right and 2.5 cm on the top and bottom.

b. Typing

The dissertation/thesis must be typed on computer. The general text of the manuscript should be typed in 1.5 line space in Arial font size 12 with both sides printing. Except photographs and tables which can be on one side of the paper. The text of the manuscript should be justified.

c. Pagination

Certificates of approval, title page, acknowledgements and abstract should be given page number in lower case Roman numerals (i, ii, iii, ...). For text, Arabic numerals (1, 2, 3, ...) should be used beginning with the first page of the text and continued throughout the rest of the dissertation/thesis including the references. The page number should be at bottom and right aligned. Suppress the page number in first page of each chapter.

d. Number of copies to be submitted and other requirements:

After completion of all the prescribed requirements of the programme, two spiral bound copies of dissertation/thesis covering research work carried out by the candidate will be submitted for evaluation by an external examiner. The title page of spiral bound copies will not have the university logo. After evaluation of dissertation/thesis by external examiner and the candidate having been declared successful in the viva-voce examination and public defense of the dissertation/thesis submitted by him, five hardbound copies of dissertation/thesis using high quality black coloured rexene with printing in golden letters on the front cover as well as on the spine of dissertation/thesis will be submitted along with a soft copy of dissertation/thesis on a CD in a format recommended by UGC for uploading at INFLIBNET website under Shodhganga. A student approval form attached as Annexure VII must be signed by the student and submitted through his/her supervisor along with the dissertation/thesis authorizing the University for putting the dissertation/thesis in public domain. The university logo is to be printed on the front cover as well as the title page of all the five copies of dissertation/thesis submitted by the candidate. A certificate to the effect that changes suggested by the external examiner has been incorporated in the text (Annexure VIII) must be submitted by the candidate along with five hard bound copies of the dissertation/thesis.

Cont.....on next page

Annexure - I

Composition of Dissertation/Thesis

1. Title Page
2. Declaration
3. Certificate
4. Abstract (Signed by student and supervisor with at least 5 key words)
5. Dedication (Optional)
6. Acknowledgement
7. Table of contents
8. List of tables
9. List of figures
10. List of appendices
11. List of abbreviations
12. Introduction (Chapter - I)
13. Review of literature (Chapter - II)
14. Material and methods (Chapter -III)
15. Results (Chapter - IV)
16. Discussion (Chapter - V)
17. Summary
18. References/Bibliography
19. Appendices (Appendix A, B, C, ...)

Instructions for title page Annexure – II

[TYPE DISSERTATION/THESIS TITLE HERE]

size 18

Dissertation/thesis submitted to the Central University of Punjab

size 14

For the award of

[Name of the degree] *size18*

In

[Name of centre] *size 14*

BY

[Name of the candidate] *size 18*

Supervisor

[Name of supervisor]

(University logo, to be put only after the acceptance of dissertation/thesis for award of degree the logo should not be more than 4.5 cm2 area)

Centre for.....*size14*
School of.....
Central University of Punjab, Bathinda

[Year with month] Font size 14

Annexure – III

CERTIFICATE

I declare that the dissertation/thesis entitled "TYPE DISSERTATION/THESIS TITLE HERE" has been prepared by me under the guidance of [Name of the supervisor], Professor/Associate Professor /Assistant Professor, [Centre for], [School of], Central University of Punjab. No part of this dissertation/thesis has formed the basis for the award of any degree or fellowship previously.

[Name and signature of candidate]
[Centre for . . .] ,
School of ..... ,
Central University of Punjab, Bathinda - 151001.
Date:

Annexure – IV

CERTIFICATE

I certify that [NAME OF CANDIDATE] has prepared his/her dissertation/thesis entitled "TYPE DISSERTATION/THESIS TITLE HERE ", for the award of M.A., M.Sc., M.Tech. ,M.Pharm., LL.M., and M.Phil/Ph.D degree of the Central University of Punjab, under my guidance. He/She has carried out this work at the Centre for....., School of..... Central University of Punjab.

[Name and signature of supervisor]

[Centre f o r . . .] ,

School of ..... ,

Central University of Punjab, Bathinda - 151001.

Date:

Annexure –V

ABSTRACT

[Type title of dissertation/thesis here]

Name of student:

Registration number:

Degree for which submitted:

Name of supervisor:

Name of centre:

Name of school:

Key words (Five minimum):

Type your abstract here in single space

(Name and signature of student)

(Name and signature of supervisor)

ACKNOWLEDGEMENTS

Type your acknowledgements here
(One page only)

Name and signature of student

TABLE OF CONTENTS

[Type your table of contents in the following format]

Sr. No.	Content	Page No.

LIST OF TABLES

[Type your list of tables here]

LIST OF FIGURES

[Type your list of figures here]

Figure Number	Description of figure	Page No.

LIST OF APPENDICES

[Type your appendices here]

Appendix Serial	Description of appendix	Page No.
A.		
B.		
C.		

LIST OF ABBREVIATIONS

[Type your list of abbreviations here]

Sr. No.	Full Form	Abbreviation

For abbreviations relating to weights, measures and calendar please see Annexture VI

CHAPTER 1

[Type your contents of first chapter here] .

Continue with other chapters in the same fashion

CHAPTER 2

CHAPTER 3

CHAPTER 4

REFRENCES

[Type your references here]

Annexure V

Standard abbreviation relating to Weights, Measures and Calendars

Weights and Measures

Abbreviation	Name
b	Billion
c	Celsius
cc	Cubic meter
cm	centimeter(s)
cu	Cubic
CWT	Hundred weight
f	foot(feet)
ft	Do part of body
gal	gallon(S)
g	gram(s)
gr	grain(s)
ha	hectare
kg	kilogram
km	kilometer(s)
l	litre
m	Meter/mile/million(s)
mg	milligram
mm	millimeter
mt	Metric tonne
q	quintal
sq	square
t	tone(s)
temp	temperature
mg	microgram
g	gram
µL	microlite

Calendar

Abbreviation	Name
AD	Anno Domini
CE	Common era
BCE	Before common era
BC	Before Christ
Cal	Calendar
Cent	Century
d	Date
hr(s)	hour(s)
m	mintue(s)
s	Second
Jan	January
Feb	Feb
Mar	March
Apr	April
May	May
June	June
Jul	Jul
Aug	August
Sept	September
Oct	October
Nov	November
Dec	December
Mon	Monday
Tue	Tuesday
Wed	Wednesday
Thu	Thursday
Fri	Friday
Sat	Saturday
Sun	Sunday
Pa	Per annum
am	Ante meridiem
pm	Post meridiem

Annexure VII

Student Approval Form

Name of the author	
Centre	
Degree	
University	
Guide	
Thesis title	
Year of award	

Agreement

1. I hereby certify that, if appropriate, I have obtained and attached hereto a written permission / statement from the owner (s) of each third party copyrighted matter to be included in my dissertation/thesis, allowing distribution as specified below.

2. I hereby grant to the university and its agents the non-exclusive license to archive and make accessible, under the conditions specified below, my dissertation/thesis, in whole or in part in all forms of media, now or hereafter known. I retain all other ownership rights to the copyright of the dissertation/thesis. I also retain the right to use in future works (such as articles or books) all or part of this thesis, dissertation, or project report.

Conditions:

1. Release the entire work for access worldwide	
2. Release the entire work for Central University of Punjab only for: 1 year 2 years 3 years and after this time release the work for access worldwide.	

3. Release the entire work for Central University of Punjab only, while at the same time releasing the following parts of the work (e.g. because other parts relate to publications) for worldwide access: a) Bibliographic details and synopsis only b) Bibliographic details, synopsis and the following chapters only c) Preview / Table of contents / page only	
4. View only (No downloads) (world wide)	

Signature of the candidate

Signature and seal of the supervisor

Place
Date

Annexure VIII

Central University of Punjab, Bathinda

Declaration

I declare that all the changes suggested by the external examiner in the dissertation/thesis entitled "type your dissertation/thesis title" submitted by me for the award of degree of Master of/Doctor of Philosophy in.....in the Centre for..... has been incorporated in the dissertation/thesis.

(Name and signature of the student)
Centre for.....
School of..... Date:

(Name and signature of the supervisor) Date:
Centre for.....
School of.....

Annexure IX

REFERENCES

(Type your references here)

Following examples for writing references are given for illustration only. The students in science subjects including Economics and Political Science and allied disciplines should consult "Publication Manual of the American Psychological Association" Sixth Edition for detailed information about referencing in APA style. Others should consult "MLA Handbook for writers of Research Papers" 7th Edition for information about referencing.

1. APA Style

a. **Reference by the same author (s) in the same year and others**

Sridhar, P. and Nivada, N.P. (2006a). Biochemical characteristics of a new strain of honey bee I. *Insect Science* **212:** 107-108.

Sridhar, P. and Nivada, N.P. (2006b).Biochemical characteristics of a new strain of honey bee II. *Insect Science* **213:** 12-23.

Other examples

Becker, G. S. and Murphy, K. M. (1988). A theory of rational addiction. *Journal of Political Economy* **96:** 675-700.

Muller, V. (2006). Film as Film: Using movies to help students visualize literary theory. *The English Journal* **95**, 32-38.

b. **Abstracts**

Singh P. S. and Wang, P. (2009). Effect of mutagen treatment on barely seeds. *Science Digest* **56:** 212 (Abstr.).

Damon, W. (1998). Impact of child psychology. *Psychological Review* **32:** 47 (Abstr.).

c. **Special supplements of Journals**

Sharma, J. P. Nilson, P. and Dawang, T. (2010). Effect of high nitrogen application on tea growth. *Journal of Environment* **225 (Supp.1):** 24-33.

Becker, G. S. Grossman, M. and Murphy, K. M. (1991). Rational addiction and the effect of price on consumption. *American Economic Review* **81 (Supp.1):** 237-41.

d. **Secondary source (original not available)**

Ramakrishnan, R., Philip, D and Jang, S. (2001). Cultivation of grasses as food crops in Plants and Soils **13:** 121-123. (Orignal not seen. Abstr. in Genetic Abstracts, **123:** Entry No. 2014, 1999).

Wright, R. (1999). Evolution and money **17:** 89-90. (Original not seen. Abstr. in Journal of Economic Dynamics and Control **38:** Entry No. 206, 1996).

e. Anonymous Publication

Anonymous (1998). Package of Practices for Rabi Crops, pp. 20-25. Punjab Agricultural University, Ludhiana.

Anonymous (1994). Economics of Rearing Pigs in China. pp. 35-36. Chinese Ministry of Agriculture Report.

f. Translated titles (in parent thesis)

Charaldsen, J. (1982). (Gastro-intestinal parasites in swine in some relatively large breeding herds) Nordisk Veterinary Medicine **24**: 427-32.

g. Books

i. Entire Book

Miglani, G. S. (2009). *Developmental Genetics,* pp.780.. Narosa Publishers, New Delhi.

Sharma, S. (1987).The Embarrassment of Riches: An Interpretation of Dutch Culture in the Golden Age. Knopf Publishers, New York.

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APPENDIX A:

[Type your appendix A here]

Annexure - 19 27

CENTRAL UNIVERSITY OF PUNJAB, BATHINDA

REGISTRAR OFFICE

41/13/14/15/1290

Dated: 04.12.2015

Subject: MACP entitlement of Pharmacist (Entry Scale PB-I) with Grade Pay Rs. 2800/- in PB-II with GP of Rs. 4200/- consequent upon Fast Track Committee recommendation- regarding.

This has reference to the UGC letter No: F. No. 7-2/2010 (JCRC) dated 12.11.2015 the above cited subject. (CP-1)

In the above mentioned letter, it is stated that para 8.1 of Annexure (I) of OM on MACP dated 19.5.2009 provides that every financial upgradation including non-functional grades granted have to be treated as an offset against one financial upgradation under the scheme.

*The UGC had sanctioned the Pharmacists position to the Central University of Punjab, bathinda **"This positions in the entry grade pay of Rs. 2800/- are getting the higher GP of Rs. 4200/- on completion of two years only. As such, they cannot said to be stagnating in the grade pay of Rs. 2800/- after entering into service. Non Functional Grade granted to pharmacists (entry grade with GP Rs. 2800/-) to the next GP of Rs. 2800/- in PB-I has to be treated as MACP. Therefore, they become entitled for 2nd MACP on completion of next 10 years on service. i.e. total 12 years of service and further 3rd MACP on completion of 22 years of continuous service."***

However, CUPB has not yet followed the Modified Assured Career Progression Scheme (MACP). Our university day by day growing and new non-teaching staffs will be join in coming days.

'A' Further, university want to needs to be put up as an agenda item in the forthcoming Executive Council meeting for considering the Modified Assured Career Progression Scheme (CP-7)

Submitted for your consideration and direction please.

[signature]
Upper Division Clerk

Assistant Registrar

submitted for consideration of the above please.

[signature]
7.12.15

Reg. Sir Recommended for approval of agenda item for forthcoming EC meeting on 'A' above.

[signature]
7/12/XV

कुलपति कार्यालय / VCO
क्र./Sr. 8707
दिनांक/Dt. 5/12/15

VC, Sir Put up to the Agenda of FC & EC

[signature]

No.35034/3/2008-Estt. (D)
Government of India
Ministry of Personnel, Public Grievances and Pensions
(Department of Personnel and Training)

.....

North Block, New Delhi, the 19th May, 2009

OFFICE MEMORANDUM

SUBJECT: - *MODIFIED ASSURED CAREER PROGRESSION SCHEME (MACPS) FOR THE CENTRAL GOVERNMENT CIVILIAN EMPLOYEES.*

******

The Sixth Central Pay Commission in Para 6.1.15 of its report, has recommended Modified Assured Career Progression Scheme(MACPS). As per the recommendations, financial upgradation will be available in the next higher grade pay whenever an employee has completed 12 years continuous service in the same grade. However, not more than two financial upgradations shall be given in the entire career, as was provided in the previous Scheme. The Scheme will also be available to all posts belonging to Group "A" whether isolated or not. However, organised Group "A" services will not be covered under the Scheme

2. The Government has considered the recommendations of the Sixth Central Pay Commission for introduction of a MACPS and has accepted the same with further modification to grant three financial upgradations under the MACPS at intervals of 10, 20 and 30 years of continuous regular service .

3. The Scheme would be known as "***MODIFIED ASSURED CAREER PROGRESSION SCHEME (MACPS) FOR THE CENTRAL GOVERNMENT CIVILIAN EMPLOYEES.*** This Scheme is in supersession of previous ACP Scheme and clarifications issued there under and shall be applicable to all regularly appointed Group "A", "B", and "C" Central Government Civilian Employees **except officers of the Organised Group "A" Service.** The status of Group "D" employees would cease on their completion of prescribed training, as recommended by the Sixth Central Pay Commission and would be treated as Group "C" employees. Casual employees, including those granted 'temporary status' and employees appointed in the Government only on adhoc or contract basis shall not qualify for benefits under the aforesaid Scheme. The details of the MACP Scheme and conditions for grant of the financial upgradation under the Scheme are given in Annexure-I.

4. An Screening Committee shall be constituted in each Department to consider the case for grant of financial upgradations under the MACP Scheme. The Screening Committee shall consist of a **Chairperson** and **two members.** The members of the Committee shall comprise officers holding posts which are at least one level above the grade in which the MACP is to be considered and not below the rank of Under Secretary equivalent in the Government. The Chairperson should generally be a grade above the members of the Committee.

5. The recommendations of the Screening Committee shall be placed before the Secretary in cases where the Committee is constituted in the Ministry/Department or before the Head of the organisation/competent authority in other cases for approval.

6. In order to prevent undue strain on the administrative machinery, the Screening Committee shall follow a **time-schedule** and meet twice in a financial year – preferably in the first week of ***January*** and first week of ***July*** of a year for advance processing of the cases maturing in that half. Accordingly, cases maturing during the first-half (April-September) of a particular financial year shall be taken up for consideration by the Screening Committee meeting in the first week of January. Similarly, the Screening Committee meeting in the first week of July of any financial year shall process the cases that would be maturing during the second-half (October-March) of the same financial year.

7. However, to make the MACP Scheme operational, the Cadre Controlling Authorities shall constitute the first Screening Committee within a month from the date of issue of these instructions to consider the cases maturing upto 30th June, 2009 for grant of benefits under the MACPS.

8. In so far as persons serving in The Indian Audit and Accounts Departments are concerned, these orders issue after consultation with the Comptroller and Auditor General of India.

9. Any interpretation/clarification of doubt as to the scope and meaning of the provisions of the MACP Scheme shall be given by the Department of Personnel and Training (Establishment-D). The scheme would be operational w.e.f. 01.09.2008. In other words, financial upgradations as per the provisions of the earlier ACP Scheme (of August, 1999) would be granted till 31.08.2008.

10. No stepping up of pay in the pay band or grade pay would be admissible with regard to junior getting more pay than the senior on account of pay fixation under MACP Scheme.

11. It is clarified that no past cases would be re-opened. Further, while implementing the MACP Scheme, the differences in pay scales on account of grant of financial upgradation under the old ACP Scheme (of August 1999) and under the MACP Scheme within the same cadre shall not be construed as an anomaly.

12. Hindi version will follow.

(S.Jainendra Kumar)
Deputy Secretary to the Govt. Of India

To

All Ministries/Departments of the Government of India

Contd...P-3/-

Copy to :-

1. President's Secretariat/Vice President's Secretariat/Prime Minister's Office/Supreme Court/Rajya Sabha Secretariat/Lok Sabha Secretariat/ Cabinet Secretariat/UPSC/CVC/C&AG/Central Administrative Tribunal (Principal Bench), New Delhi.
2. All attached/subordinate offices of the Ministry of Personnel, Public Grievances and Pensions.
3. Secretary, National Commission for Minorities.
4. Secretary, National Commission for Scheduled Castes/Scheduled Tribes
5. Secretary, Staff Side, National Council (JCM), 13-C, Ferozeshah Road, New Delhi
6. All Staff Side Members of the National Council (JCM)
7. Establishment (D) Section - 1000 copies
8. NIC, DoPT, North Block for up-loading of the OM in DoPT website.

*****

Contd_P-4

MODIFIED ASSURED CAREER PROGRESSION SCHEME (MACPS)

1. There shall be three financial upgradation s under the MACPS, counted from the direct entry grade on completion of 10, 20 and 30 years service respectively. Financial upgradation under the Scheme will be admissible whenever a person has spent 10 years continuously in the same grade-pay.

2. The MACPS envisages merely placement in the immediate next higher grade pay in the hierarchy of the recommended revised pay bands and grade pay as given in Section 1 , Part-A of the first schedule of the CCS (Revised Pay) Rules, 2008. Thus, the grade pay at the time of financial upgradation under the MACPS can, in certain cases where regular promotion is not between two successive grades, be different than what is available at the time of regular promotion. In such cases, the higher grade pay attached to the next promotion post in the hierarchy of the concerned cadre/organisation will be given only at the time of regular promotion.

3. The financial upgradation s under the MACPS would be admissible up-to the highest grade pay of Rs. 12000/ in the PB-4.

4. Benefit of pay fixation available at the time of regular promotion shall also be allowed at the time of financial upgradation under the Scheme. Therefore, the pay shall be raised by 3% of the total pay in the pay band and the grade pay drawn before such upgradation. There shall, however, be no further fixation of pay at the time of regular promotion if it is in the same grade pay as granted under MACPS. However, at the time of actual promotion if it happens to be in a post carrying higher grade pay than what is available under MACPS, no pay fixation would be available and only difference of grade pay would be made available. **To illustrate, in case a Government Servant joins as a direct recruit in the grade pay of Rs. 1900 in PB-1 and he gets no promotion till completion of 10 years of service, he will be granted financial upgradation under MACPS in the next higher grade pay of Rs. 2000 and his pay will be fixed by granting him one increment plus the difference of grade pay (i.e. Rs. 100). After availing financial upgradation under MACPS, if the Government servant gets his regular promotion in the hierarchy of his cadre, which is to the grade of Rs. 2400, on regular promotion, he will only be granted the difference of grade pay between Rs. 2000 and Rs. 2400. No additional increment will be granted at this stage.**

5. Promotions earned/upgradations granted under the ACP Scheme in the past to those grades which now carry the same grade pay due to merger of pay scales/upgradations of posts recommended by the Sixth Pay Commission shall be ignored for the purpose of granting upgradations under Modified ACPS.

Contd...P-5/-

Illustration-1

The pre-revised hierarchy (in ascending order) in a particular organization was as under:-

Rs. 5000-8000, Rs. 5500-9000 & Rs. 6500-10500.

(a) A Government servant who was recruited in the hierarchy in the pre-revised pay scale Rs. 5000-8000 and who did not get a promotion even after 25 years of service prior to 1.1.2006, in his case as on 1.1.2006 he would have got two financial upgradations under ACP to the next grades in the hierarchy of his organization, i.e., to the pre-revised scales of Rs. 5500-9000 and Rs. 6500-10500.

(b) Another Government servant recruited in the same hierarchy in the pre-revised scale of Rs. 5000-8000 has also completed about 25 years of service, but he got two promotions to the next higher grades of Rs. 5500-9000 & Rs. 6500-10500 during this period.

In the case of both (a) and (b) above, the promotions/financial upgradations granted under ACP to the pre-revised scales of Rs. 5500-9000 and Rs. 6500-10500 prior to 1.1.2006 will be ignored on account of merger of the pre-revised scales of Rs. 5000-8000, Rs. 5500-9000 and Rs. 6500-10500 recommended by the Sixth CPC. As per CCS (RP) Rules, both of them will be granted grade pay of Rs. 4200 in the pay band PB-2. After the implementation of MACPS, two financial upgradations will be granted both in the case of (a) and (b) above to the next higher grade pays of Rs. 4600 and Rs. 4800 in the pay band PB-2.

6. In the case of all the employees granted financial upgradations under ACPS till 01.01.2006, their revised pay will be fixed with reference to the pay scale granted to them under the ACPS.

6.1 In the case of ACP upgradations granted between 01.01.2006 and 31.08.2008, the Government servant has the option under the CCS (RP) Rules, 2008 to have his pay fixed in the revised pay structure either (a) w.e.f. 01.01.2006 with reference to his pre-revised scale as on 01.01.2006; or (b) w.e.f. the date of his financial upgradation under ACP with reference to the pre-revised scale granted under ACP. In case of option (b), he shall be entitled to draw his arrears of pay only from the date of his option i.e. the date of financial upgradation under ACP.

6.2 In cases where financial upgradation had been granted to Government servants in the next higher scale in the hierarchy of their cadre as per the provisions of the ACP Scheme of August, 1999, but whereas as a result of the implementation of Sixth CPC's recommendations, the next higher post in the hierarchy of the cadre has been upgraded by granting a higher grade pay, the pay of such employees in the revised pay structure will be fixed with reference to the higher grade pay granted to the post. To illustrate, in the case of Jr. Engineer in CPWD, who was granted 1st ACP in his hierarchy to the grade of Asstt. Engineer in the pre-revised scale of Rs.6500-10500 corresponding to the revised grade pay of Rs.4200 in the pay band PB-2, he will now be granted grade pay of Rs.4600 in the pay band PB-2 consequent upon upgradation of the post of Asstt. Enggs. In CPWD by granting them the grade pay of Rs.4600 in PB-2 as a result of Sixth CPC's recommendation. However, from the date of implementation of the MACPS, all the financial upgradations under the Scheme should be done strictly in accordance with the hierarchy of grade pays in pay bands as notified vide CCS (Revised Pay) Rules [illegible]

7. With regard to fixation of his pay on grant of promotion/financial upgradation under MACP Scheme, a Government servant has an option under FR22 (I) (a) (1) to get his pay fixed in the higher post/ grade pay either from the date of his promotion/upgradation or from the date of his next increment viz. 1st July of the year. The pay and the date of increment would be fixed in accordance with clarification no.2 of Department of Expenditure's O.M. No.1/1/2008-IC dated 13.09.2008.

8. Promotions earned in the post carrying same grade pay in the promotional hierarchy as per Recruitment Rules shall be counted for the purpose of MACPS.

8.1 Consequent upon the implementation of Sixth CPC's recommendations, grade pay of Rs. 5400 is now in two pay bands viz., PB-2 and PB-3. The grade pay of Rs. 5400 in PB-2 and Rs.5400 in PB-3 shall be treated as separate grade pays for the purpose of grant of upgradations under MACP Scheme.

9. 'Regular service' for the purposes of the MACPS shall commence from the date of joining of a post in direct entry grade on a regular basis either on direct recruitment basis or on absorption/re-employment basis. Service rendered on adhoc/contract basis before regular appointment on pre-appointment training shall not be taken into reckoning. However, past continuous regular service in another Government Department in a post carrying same grade pay prior to regular appointment in a new Department, without a break, shall also be counted towards qualifying regular service for the purposes of MACPS only (and not for the regular promotions). However, benefits under the MACPS in such cases shall not be considered till the satisfactory completion of the probation period in the new post.

10. Past service rendered by a Government employee in a State Government/statutory body/Autonomous body/Public Sector organisation, before appointment in the Government shall not be counted towards Regular Service.

11. 'Regular service' shall include all periods spent on deputation/foreign service, study leave and all other kind of leave, duly sanctioned by the competent authority.

12. The MACPS shall also be applicable to work charged employees, if their service conditions are comparable with the staff of regular establishment.

13. Existing time-bound promotion scheme, including in-situ promotion scheme, Staff Car Driver Scheme or any other kind of promotion scheme existing for a particular category of employees in a Ministry/Department or its offices, may continue to be operational for the concerned category of employees if it is decided by the concerned administrative authorities to retain such Schemes, after necessary consultations or they may switch-over to the MACPS. However, these Schemes shall not run concurrently with the MACPS.

14. The MACPS is directly applicable only to Central Government Civilian employees. It will not get automatically extended to employees of Central Autonomous/Statutory Bodies under the administrative control of a Ministry/Department. Keeping in view the financial implications involved, a conscious decision in this regard shall have to be taken by the respective Governing Body/Board of Directors and the administrative Ministry concerned and where it is proposed to adopt the MACPS, prior concurrence of Ministry

15. If a financial upgradations under the MACPS is deferred and not allowed after 10 years in a grade pay, due to the reason of the employees being unfit or due to departmental proceedings, etc., this would have consequential effect on the subsequent financial upgradation which would also get deferred to the extent of delay in grant of first financial upgradation.

16. On grant of financial upgradation under the Scheme, there shall be no change in the designation, classification or higher status. However, financial and certain other benefits which are linked to the pay drawn by an employee such as HBA, allotment of Government accommodation shall be permitted.

17. The financial upgradation would be on non-functional basis subject to fitness, in the hierarchy of grade pay within the PB-1. Thereafter for upgradation under the MACPS the benchmark of 'good' would be applicable till the grade pay of Rs. 6600/- in PB-3. The benchmark will be 'Very Good' for financial upgradation to the grade pay of Rs. 7600 and above.

18. In the matter of disciplinary/ penalty proceedings, grant of benefit under the MACPS shall be subject to rules governing normal promotion. Such cases shall, therefore, be regulated under the provisions of the CCS (CCA) Rules, 1965 and instructions issued thereunder.

19. The MACPS contemplates merely placement on personal basis in the immediate higher Grade pay /grant of financial benefits only and shall not amount to actual/functional promotion of the employees concerned. Therefore, no reservation orders/roster shall apply to the MACPS, which shall extend its benefits uniformly to all eligible SC/ST employees also. However, the rules of reservation in promotion shall be ensured at the time of regular promotion. For this reason, it shall not be mandatory to associate members of SC/ST in the Screening Committee meant to consider cases for grant of financial upgradation under the Scheme.

20. Financial upgradation under the MACPS shall be purely personal to the employee and shall have no relevance to his seniority position. As such, there shall be no additional financial upgradation for the senior employees on the ground that the junior employee in the grade has got higher pay/grade pay under the MACPS.

21. Pay drawn in the pay band and the grade pay allowed under the MACPS shall be taken as the basis for determining the terminal benefits in respect of the retiring employee.

22. If Group "A" Government employee, who was not covered under the ACP Scheme has now become entitled to say third financial upgradation directly, having completed 30 year's regular service, his pay shall be fixed successively in next three immediate higher grade pays in the hierarchy of revised pay-bands and grade pays allowing the benefit of 3% pay fixation at every stage. Pay of persons becoming eligible for second financial upgradation may also be fixed accordingly.

Contd_P-8/-

23. In case an employee is declared surplus in his/her organisation and appointed in the same pay-scale or lower scale of pay in the new organization, the regular service rendered by him/her in the previous organisation shall be counted towards the regular service in his/her new organisation for the purpose of giving financial upgradation under the MACPS.

24. In case of an employee after getting promotion/ACP seeks unilateral transfer on a lower post or lower scale, he will be entitled only for second and third financial upgradations on completion of 20/30 years of regular service under the MACPS, as the case may be, from the date of his initial appointment to the post in the new organization.

25. If a regular promotion has been offered but was refused by the employee before becoming entitled to a financial upgradation, no financial upgradation shall be allowed as such an employee has not been stagnated due to lack of opportunities. If, however, financial upgradation has been allowed due to stagnation and the employees subsequently refuse the promotion, it shall not be a ground to withdraw the financial upgradation. He shall, however, not be eligible to be considered for further financial upgradation till he agrees to be considered for promotion again and the second the next financial upgradation shall also be deferred to the extent of period of debarment due to the refusal.

26. Cases of persons holding higher posts purely on adhoc basis shall also be considered by the Screening Committee alongwith others. They may be allowed the benefit of financial upgradation on reversion to the lower post or if it is beneficial vis-a-vis the pay drawn on adhoc basis.

27. Employees on deputation need not revert to the parent Department for availing the benefit of financial upgradation under the MACPS. They may exercise a fresh option to draw the pay in the pay band and the grade pay of the post held by them or the pay plus grade pay admissible to them under the MACPS, whichever is beneficial.

28. <u>Illustrations</u>

A (i) If a Government servant (LDC) in PB-I in the Grade Pay of Rs.1900 gets his first regular promotion (UDC) in the PB-I in the Grade Pay of Rs.2400 on completion of 8 years of service and then continues in the same Grade Pay for further 10 years without any promotion then he would be eligible for 2nd financial upgradation under the MACPS in the PB-I in the Grade Pay of Rs.2800 after completion of 18 years (8+10 years).

(ii) In case he does not get any promotion thereafter, then he would get 3rd financial upgradation in the PB-II in Grade Pay of Rs.4200 on completion of further 10 years of service i.e. after 28 years (8+10+10).

(iii) However, if he gets 2nd promotion after 5 years of further service in the pay PB-II in the Grade Pay of Rs.4200 (Asstt. Grade/Grade "C") i.e. on completion of 23 years (8+10+5years) then he would get 3rd financial upgradation after completion of 30 years i.e. 10 years after the 2nd ACP in

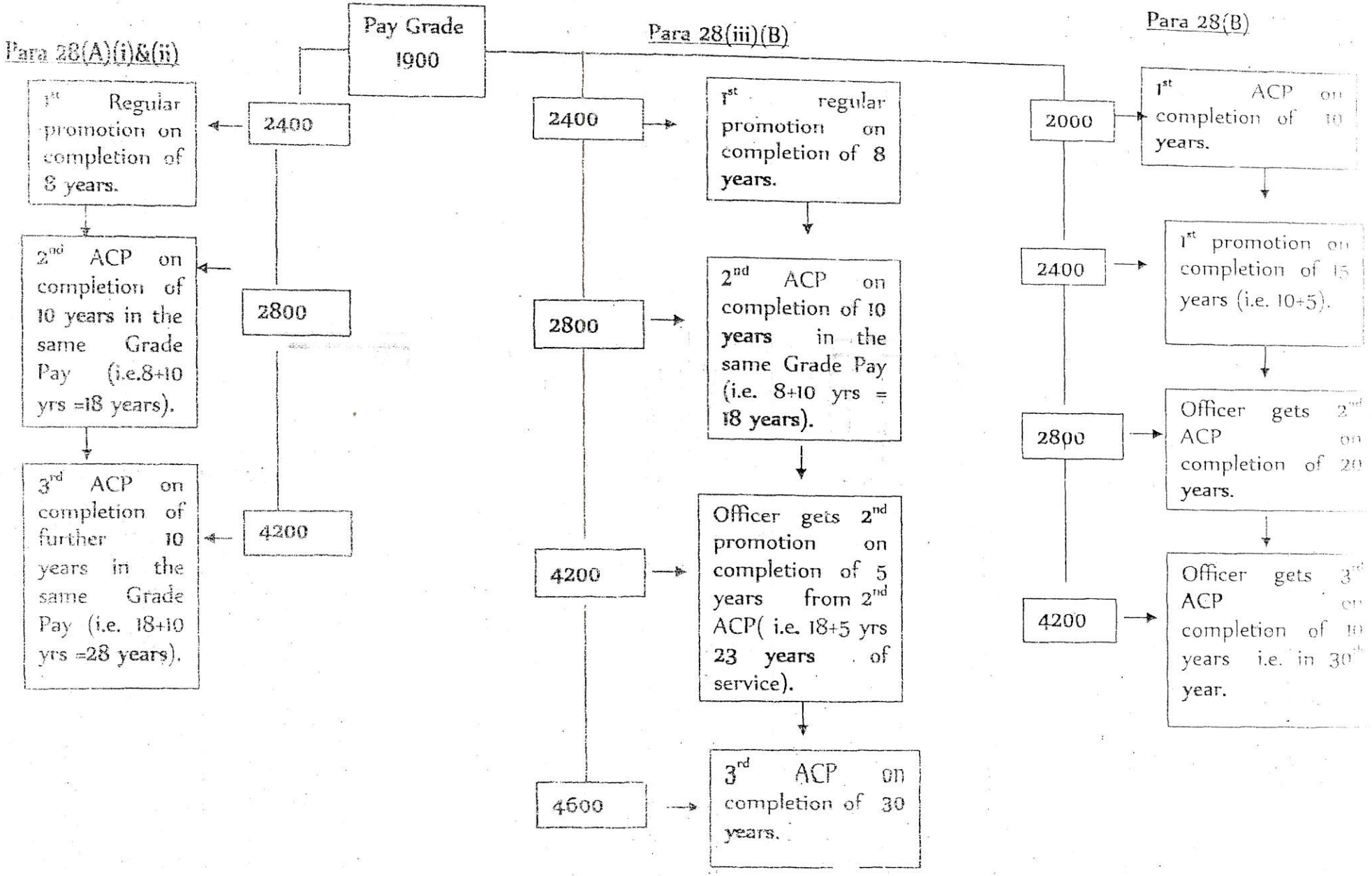
In the above scenario, the pay shall be raised by 3% of the total pay in the Pay Band and Grade Pay drawn before such upgradation. There shall, however, be no further fixation of pay at the time of regular promotion if it is in the same Grade Pay or in the higher Grade Pay. Only the difference of grade pay would be admissible at the time of promotions.

B. If a Government servant (LDC) in PB-1 in the Grade Pay of Rs.1900 is granted 1st financial upgradation under the MACPS on completion of 10 years of service in the PB-1 in the Grade Pay of Rs.2000 and 5 years later he gets 1st regular promotion (UDC) in PB-1 in the Grade Pay of Rs.2400, the 2nd financial upgradation under MACPS (in the next Grade Pay w.r.t. Grade Pay held by Government servant) will be granted on completion of 20 years of service in PB-1 in the Grade Pay of Rs.2800. On completion of 30 years of service, he will get 3rd ACP in the Grade Pay of Rs. 4200. However, if two promotions are earned before completion of 20 years, only 3rd financial upgradation would be admissible on completion of 10 years of service in Grade Pay from the date 2nd promotion or at 30th year of service, whichever is earlier.

C. If a Government servant has been granted either two regular promotions or 2nd financial upgradation under the ACP Scheme of August, 1999 after completion of 24 years of regular service then only 3rd financial upgradation would be admissible to him under the MACPS on completion of 30 years of service provided that he has not earned third promotion in the hierarchy.

(S.Jainendra Kumar)
Deputy Secretary to the Govt. Of India

ILLUSTRATIONS



विश्वविद्यालय अनुदान आयोग
University Grants Commission
मानव संसाधन विकास मंत्रालय, भारत सरकार
(Ministry of Human Resource Development, Govt. of India)
बहादुरशाह ज़फर मार्ग नई दिल्ली – 110 002
Bahadurshah Zafar Marg, New Delhi-110002
Phone : 011-23406310

F. No 7-2/2010 (JCRC)

November, 2015

12 NOV 2015

The Registrar
Central University of Punjab
Mansa Road,
Bathinda – 151 001

Subject: MACP entitlements of Pharmacist (Entry Scale PB-I with Grade Pay Rs.2800/- in PB-II with GP of Rs.4200/- consequent upon Fast Track Committee recommendations – regarding.

I am directed to enclose herewith a copy of OM No. 35014/2014-Estt. D dated 10.06.2015 issued by the Ministry of Personnel PG & Pension, Department of Personnel & Training on the above subject for information and necessary action.

Yours faithfully

Encl. as above:-

(R.K Sharma)
Under Secretary

26/11/XV

AR(Estt)
May please guide if the above needs to be put up as an agenda item in the forthcoming EC meeting.

27-11

Regd.
What is present status?
27/11

AR(Estt)
JA/UDC

Government of India
Ministry of Personnel P.G. & Pensions
Department of Personnel & Training

North Block, New Delhi
Dated 17.06.2015

To

1. Shri Shiva Gopal Mishra,
Secretary,
National Council (Staff Side),
Joint Consultative Machinery,
13-C, Ferozshah Road,
New Delhi-110001.

Subject- MACP entitlements of Pharmacist (Entry Scale PB-I with Grade Pay Rs. 2800/- to PB-II with GP of Rs. 4200/- consequent upon Fast Track Committee recommendations-regarding.

Sir,

I am directed to refer to your letter No. NC/JCM/2015/MACP dated 06.05.2015 on the above mentioned subject.

2. With regard to point (i) raised in your above mentioned letter, it is stated that Para 8 of Annexure-I of OM on MACPS dated 19.05.2009 provides that every financial upgradation including non-functional grades granted have to be treated as an offset against one financial upgradation under the Scheme.

The Pharmacists in the entry grade pay of Rs. 2800/- are getting the higher GP of Rs. 4200/- on completion of two years only. As such, they can not said to be stagnating in the grade pay of Rs. 2800/- after entering into service. Non Functional Grade granted to Pharmacists (entry grade with GP Rs. 2800/-) to the next GP of Rs. 4200/- in PB-2 on completion of 2 years of service in the GP of Rs. 2800/- in PB-1 has to be treated as 1st MACP. Therefore, they become entitled for 2nd MACP on completion of next 10 years of service i.e. total 12 years of service and further 3rd MACP on completion of 22 years of continuous service.

3. So far as the issue (ii) raised in your letter, it is informed that the MACP Scheme has come into force w.e.f. 01.09.2008 which provides financial upgradation in the grade pay hierarchy. The ACP Scheme was in operation between 01.01.2006-31.08.2008. Financial upgradations under ACP Scheme were allowed in the promotional hierarchy as per the existing hierarchy and Non Functional Upgradation was not treated as financial upgradation under ACP Scheme. Hence, the Pharmacists on completion of 12 years or 24 years of service are to be allowed financial upgradation under the ACP Scheme in the promotional hierarchy existing between 01.01.2006 to 31.08.2008.

4 As regards, point (iii) it is clarified that the Pharmacists, at the time of their placement from GP of Rs. 2800/- in PB-1 to GP of Rs. 4200/- in PB-2, they may be allowed the pay fixation benefit equal to 3% of existing basic pay and the difference in GP as consequent to such 'placement' not only the Grade Pay changes but does the Pay Band also. This is also in conformity with the para 4 of Annexure to the OM dated 19.05.2009, since it is being treated as first financial upgradation under the MACPS.

Yours faithfully,

(Mukta Goel)
Director (E-I)
Phone No. 23092479

Copy for information alongwith letter dated 06.05.2015 of Secretary (Staff Side) NC JCM to:-

1. Ministry of Health & Family Welfare, Nirman Bhawan, New Delhi.
2. Ministry of Defence, South Block, New Delhi.
3. Ministry of Railways, Rail Bhawan, New Delhi.
4. DS/Pay, North Block, North Block, New Delhi.
5. Director(JCA), North Block, New Delhi.

(Mukta Goel)
Director (E-I)
Phone No. 23092479

पंजाब केन्द्रीय विश्वविद्यालय

Central University of Punjab

Ref. No. CUPB/CC/15/PL/13, Y Dated 09.12.2015

Proceedings of the Meeting of the Review Committee constituted to assess the performance of the non-teaching staff who have completed their Probation.

1. The committee constituted vide Office Order No CUPB/CC/15/OO/205 dated 18.11.2015 to examine the performance during the period of probation of Mr. Amandeep Singh Mann, System Analyst, who is on probation of two years w.e.f 05.6.2013. The Committee assembled on 09 December 2015 in the Office Chamber of the Dean Academic Affairs and examined the case.

2. The committee discussed the recommendations of the Reporting and Reviewing Officer and also discussed the rules and regulations for lifting of probation. The committee is of the view that as the time lines defined in the rules have lapsed a long before (in June 2015) and as per rules, if action of extension of probation period is not initiated/intimated prior to the date of completion of probation, then probation needs to be lifted.

3. After taking into consideration the rules for lifting of probation the committee recommends that the Probation of Mr. Amandeep Singh Mann, System Analyst be lifted with a condition that he will undergo couple of training programmes on the recommended areas. Further, Mr. Amandeep should also be warned that he should work with sincerity and dedication.

4. The committee also recommends that the observation of reporting and reviewing Officers be recorded in APAR of the concerned year.

Prof. P. Ramarao
Dean, Academic Affairs
CUPB

Prof. R. C. Sharma
Dean, Students Welfare
CUPB

Dr. Anjana Munshi
CoC, Centre for HGMM
CUPB

9/12/15

Dr. [illegible]
Registrar
CUPB

Mrs. Shweta Arora
Deputy Registrar
CUPB

Recommendations of the Committee submitted for acceptance and according approval for further administrative action.

No of staff appointed and joined after 31.10.2015

Non-Teaching Staff

Sr. No	Name	Designation	Date of joining	Position	Remarks
1	Dr. Mridula Mittal	Medical Officer	20.11.2015	Regular	

No of staff resigned/relieved after 31.10.2015

Sr. No	Name	Designation	Date of Resignation/ Completion of term	Nature of Appointment	Remarks
Teaching					
1	Er. Navjot Sidhu	Assistant Professor	09.11.2015 (F.N.)	Contractual	Resigned
2	Dr. Shireesh Pal Singh	Assistant Professor	30.11.2015 (A.N.)	Regular	Resigned
3	Dr. Satvinderpal Kaur	Associate Professor	08.12.2015 (A.N.)	Regular	Resigned
Non-Teaching					
1	Mr. Vishal Thakur	Laboratory Attendant	19.11.2015 (A.N.)	Regular	Resigned
2	Mr. Lakhvir Singh	Data Entry Operator	25.11.2015 (A.N.)	Contractual	Resigned

No. 15012/2/2010-Estt.(D)
Government of India
Ministry of Personnel, Public Grievances and Pensions
(Department of Personnel & Trainning)
****

New Delhi, dated the 27th March, 2012

OFFICE MEMORANDUM

Subject:- **Consolidated orders on relaxation in upper age limit allowed to various categories of government servants**- regarding

The undersigned is directed to invite attention to this Department's Notification No. 2/101/72-Estt(D) dated 07.03.1974 and to say that since then a number of instructions allowing relaxation in upper age to Central government servants for recruitment to various categories of posts under the Central government have been issued. For the facility of reference and guidance, the content of the important/relevant O.M's/orders on the subject have been consolidated. The number and date of original O.M.'s have been referred under each category for easy reference to the context.

S. No.	Category of Persons to whom age concession is admissible and O.M./Notification No.	Categories of posts to which the age concession is admissible	Extent of Age Concession
1.	Scheduled Castes and Scheduled Tribes Notification No. 2/101/72-Estt(D) dated 07.03.1974	All posts filled by Direct Recruitment	5 years
2.	Other Backward Class O.M. No. 43013/2/95-Estt. (SCT) dated 25.01.1995 O.M. No. 36012/22/93-Estt.(SCT) dated 22.10.1993	All posts filled by Direct Recruitment	3 years
3.	Persons with disabilities No. 43019/28/86-Estt.(D) dated 01.02.1999 read with O.M. No. 36035/3/2004-Estt(Res.) dated 29.12.2005	(i) In case of Direct Recruitment to Group 'C' and erstwhile Group 'D' (now MTS)	10 years

		posts (ii) In case of recruitment to Group 'A' and Group 'B' posts through open competitive examination	
	SC/ST Persons with disabilities		15 years
	OBC Persons with disabilities		13 years
	Persons with disabilities O.M. No. 36035/3/2004-Estt(Res.) dated 29.12.2005	In case of direct recruitment to Group 'A' and Group 'B' where recruitment is made otherwise than through open competitive examination	5 years
	SC/ST Persons with disabilities		10 years
	OBC Persons with disabilities		8 years
4.	Retrenched Central Government Employee Notification No. 2/101/72-Estt(D) dated 07.03.1974	For posts filled otherwise than through UPSC on the basis of competitive tests, i.e. filled through employment exchange	Period of previous service under the Govt. of India plus three years
5.	Whole Time Cadet Instructors in NCC	For the purpose of appointment to the posts, recruitment to which is made through the Employment exchange	Period of service rendered in NCC plus three years
	(a) who were released from NCC after the expiry of their initial/ extended tenure Notification No. 2/101/72-Estt(D) dated 07.03.1974		
	(b) who were released form NCC before the expiry of their initial/extended tenure Notification No. 2/101/72-Estt(D) dated 07.03.1974	- do -	Period of service rendered in NCC, plus three years provided they have served in NCC for a period of not less than six months prior to their release from NCC

6.	Ex-General Reserve Engineer Force Personnel O.M. No. 4/10/64-Estt(D) dated 26.10.1964 Notification No. 2/101/72-Estt(D) dated 07.03.1974	For posts filled otherwise than through UPSC on the basis of competitive tests, i.e. filled through Employment exchange	Period of Service in GREF plus 3 years
7.	Territorial Army Personnel who have service on the permanent staff of Territorial Army Unit or have been embodied for service under T.A. Rule 33 for a continuous period of not less than six months. O.M. No. 4/6/64-Estt(D) dated 11.02.1965 and Notification No. 2/101/1972-Estt(D) dated 7.3.1974	For post filled otherwise than through UPSC on the basis of competitive tests i.e. for posts filled through Employment Exchange	Entire Period of embodied service including broken period in the Territorial Army plus three years
8.	Ex-Servicemen Notification No. 39016/10/1979- Estt. (c) dated 15.12.1979	Group C & erstwhile D posts	Period of Military service plus 3 years
9.	Disabled Defence services personnel O.M. No. 14/42/65-Estt(D) dated 29.03.1966 and O.M. No. 13/35/71-Estt.(C) dated 24.12.1971	(a) Group C & erstwhile D posts filled through Employment Exchange	45 years (50 years of SC/ST)
		(b) Group A & B posts filled otherwise than through Competitive Examination by UPSC	45 years (50 years of SC/ST)
	O.M. No. 39016/5/1981-Estt.(C) dated 21.02.1981	(c) All posts filled by Competitive examination	3 years (8 years for SC/ST) subject to the condition that they would not be allowed to avail of

			a larger number of chances in respect of recruitment to a service, or group of services, than the maximum number of chances permissible to any general candidate under the age limit.
10.	Ex-personnel of Army Medical Corps (Short Service regular Commissioned Officer) **O.M. No. 4/3/55-RPS dated 13.07.1956**	All posts requiring Medical qualification	35 years
11.	Ex-servicemen ECO/SSCO **O.M. No. 39016/15/79-Estt.(C) dated 07.09.1981** **O.M. No. 36034/8/88-Estt.(SCT) dated 19.05.1988**	Group A & B Posts Services/posts filled by direct recruitment otherwise than on a result of any open All India competitive examination held by UPSC subject to the condition that (i) the continuous service rendered in teh Armed Forces by an ex-servicemen is not less than six months after attestation (ii) resultant age after deducting his age does not exceed the prescribed age	Military service plus three years

		limit by more than three years and (iii) condition prescribed in O.M. No. 39016/10/79-Esst.(C) dated 15.12.1979	
		For appointment to any vacacny in Group A and Group B Services/posts filled by direct recruitment on the results of an All India Competitive Examination held by UPSC, ex-service and Commissioned Officers including ECOs/SSCOs who have rendered atleast 5 years military service and have been released on completion of assignment (including those whose assignment is due to be completed within 6 months) otherwise than by way of dismissal or discharge on account of physical disability attributable to	Five years

		military service or on invalidment.	
12.	Departmental Candidates with three years continuous service in Central Government O.M. No. 15012/1/88-Esst.(D) dated 30.01.1980 O.M. No. 15012/1/88-Esst.(D) dated 20.05.1988	For appointment to Group 'C' and erstwhile 'D' (now MTS posts) by direct recruitment which are in the same line or allied cadres	Up to 40 years of age (45 years for SC/ST)
	O.M. No. 15012/8/87-Estt.(D) dated 15.10.1987 O.M. No. 35014/4/79-Esst.(D) dated 24.10.1985	Group A and Group B posts filled through UPSC (other than those filled on the basis of competitive examination) and posts which are exempted from purview of UPSC (where recruitment is made by organisation themselves)	5 years. (for posts which are in the same line or allied cadres and where a relationship could be established that the service already rendered in a particular post will be useful for the efficient discharge of the duties of post
13.	Widows, divorced women and women judicially separated from their husbands and who are not re-married O.M. NO. 15012/13/1979-Estt (D) dated 19.01.1980 O.M. No. 15012/1/82-Estt.(D) dated 06.09.1983	Group 'C' and erstwhile Group 'D' posts under the Central Government filled through Staff Selection Commission and Employment exchange	Up to the age of 35 years (up to 40 years for members of Scheduled Castes and Scheduled Tribes) but no relaxation of educational qualification or method of recruitment
	O.M. No. 15012/1/87-Estt.(D) dated 05.10.1990	Group 'A' and 'B' posts except where recruitment is	

		made through open competitive examination	
14.	Meritorious Sportspersons No. 15012/3/84-Estt.(D) dated 12.11.1987	All Group of Civil posts/Services under the Government of India filled otherwise than through Competitive examinations conducted by UPSC	Up to 5 years (10 years for SC/ST candidates)
15.	Persons who had ordinarily been domiciled in the State of Jammu and Kashmir during the period 01.01.1980 to 31.12.1989 **GSR 915(E) dated 30.12.2011** GSR 208(E) dated 10th April 1997 GSR 826(E) dated 27th December 1999 GSR 919(E) dated 20th December 2001 GSR 879(E) dated 10th November 2003 GSR 707(E) dated 6th December 2005 GSR 761(E) dated 7th December, 2007 GSR 839(E) dated 23rd November 2009	For recruitment to all Central Civil Services and Posts made through UPSC or SSC or otherwise by Central Government till 31.12.2013	Upper age-limit relaxable by five years subject to maximum number of chances permissible under the relevant rules

2. For the purposes of the above mentioned age concessions:

i. "a retrenched Central Government employee" means a person who was employed under the Government of India for a continuous period of not less than six months prior to this retrenchment and was discharged as a result of the recommendation of the Economy Unit or due to normal reduction in establishment;

ii. "a whole-time Cadet instructor in NCC" means a person who was recruited as a whole-time cadet instructor in NCC on or after 01.01.1963;

iii. "Ex-GREF personnel" means a person who was employed in that Force at least a continuous period for not less than six months and who was released from that Force on completion of his tenure of Service.

iv. "disabled ex-servicemen" means ex-serviceman who while serving in the Armed Forces of the Union was disabled in operations against the enemy or in disturbed areas;

v. "Ex-servicemen" means a person, who has served in any rank (whether as a combatant or an non-combatant), in the Armed Forces of the Union, including the Armed Forces of the former Indian States, but excluding the Assam Rifles, Defence Security Corps, General Reserve Engineering Force, Lok Sahayak Sena and Territorial Army, for a continuous period of not less than six months after attestation, and (i) has been released, otherwise than at his own request or by way of dismissal or discharge on account of misconduct or inefficiency, or has been transferred to the reserve pending such release, or (iii) has been released at his own request after completing five years service in the Armed Forces of the Union.

3. These instructions are applicable only to Central Government Civilian Employees holding Civil posts and are not applicable to personnel working in autonomous/statutory bodies, Public Sector under taking etc. which are governed by regulations/statute issued by the concerned administrative Ministries/Departments. In certain cases the benefit of age relaxation was allowed to a specified category of personnel for a limited period. The validity of relaxation in such cases will be for the period specified in the original instructions or as amended from time to time.

4. In case of recruitment through the UPSC and the Staff Selection Commission(SSC), the crucial date for determining the age-limit shall be as advertised by UPSC/SSC. The crucial date for determining age for competitive examination held by UPSC/SSC is fixed as per the instructions in this Department's O.M. No. 42013/1/79-Estt.(D) dated 04.12.1979 and O.M. No. AB.14017/70/87-Esst.(RR) dated 14.07.1988.

5. A government servant is not allowed any relaxation of age for recruitment to Group 'A' and Group 'B' post on the basis of competitive examination held by the Commission except in cases where it has been specifically provided for in the scheme of the examinations approved in consultation with the Commission(O.M. No. 4/4/74-Estt.(D) dated 09.04.1981).

6. The upper age-limit for recruitment by the method of Direct Open Competitive to the Central Civil Services and civil posts specified in the relevant service/recruitment rules on the date of commencement of the Central Civil Services and Civil posts (Upper Age-limit for Direct Recruitment) Rules 1998, shall be increased by two years (Notification No. 15012/6/98-Estt.(D) dated 21.12.1998). The "Direct Open Competitive Examination" for the purpose of these rules shall mean direct recruitment by Open Competitive Examination conducted by the Union Public Service Commission or the Staff Selection Commission or any other authority under the Central Government and it shall not include recruitment through Limited Departmental Examination or through shortlisting or by absorption or transfer or deputation.

8. Copies of previous O.M.'s referred are available at this Department's website www.persmin.nic.in(www.persmin.nic.in>O.Ms & Orders > Establishment > (A)Administration > (II)Establishment > (g)Age relaxation)

9. This may be brought to the notice of all concerned for information, guidance and necessary action.

10. Hindi version will follow.

(Mukta Goel)
Director(E.I)
Tele: 23092479

To

All Ministries/Departments of the Government of India.
Copy to:

1. President's Secretariat, New Delhi
2. Vice-President's Secretariat, New Delhi
3. The Prime Minister's Office, New Delhi
4. Cabinet Secretariat, New Delhi
5. Rajya Sabha Secretariat/Lok Sabha Secretariat, New Delhi
6. The Registrar General, the Supreme Court of India, New Delhi.
7. The Registrar, Central Administrative Tribunal, Principal Bench., New Delhi.
8. The Comptroller and Auditor General of India, New Delhi
9. The Secretary, Union Public Service Commission, New Delhi
10. The Secretary, Staff Selection Commission, New Delhi
11. All attached offices under the Ministry of Personnel, Public Grievances and Pensions
12. National Commission for Scheduled Castes, New Delhi
13. National Commission for Scheduled Tribes, New Delhi
14. National Commission for OBCs, New Delhi
15. Secretary, National Council (JCM), 13, Ferozeshah Road, New Delhi.
16. Establishment Officer & A.S.
17. All Officers and Sections in the Department of Personnel and Training.
18. Facilitation Center, DOP&T (20 copies)
19. NIC (DOP&T) for placing this Office Memorandum on the Website of DOP&T.
20. Establishment Section (200 copies).

27/3/2012
(Virender Singh)
Under Secretary to the Government of India
Tele: 23093804

W-1

1-12-15

Direction
Disposed of

IN THE HIGH COURT OF PUNJAB & HARYANA CHANDIGARH.

To:-

1. State of Punjab through Principal Secretary, Department of Higher Education, Punjab Civil Secretariat, Chandigarh.
2. Director Public Instruction (Higher Education), Punjab, Punjab Civil Secretariat, Chandigarh.
3. The Central University of Punjab through its Vice – Chancellor, Bathinda Punjab.
4. Centre of Bio Sciences, through its Centra Co-ordinator, Central University of Punjab, Bathinda, Punjab.
5. M/s Ranker Security Service Pvt. Ltd., Bathinda 22310, Street No. 1, Sharat Nagar, Near GN School, Bathinda, Punjab.

SUBJECT:- CIVIL WRIT PETITION No. 20364 of 2015 (O&M)

Gopal Singh Soni

Petitioner(s)

Versus

State of Punjab and others

Respondent(s)

Sir,

In continuation of this Court's order dated 19.10.2015, I am directed to forward herewith a copy of order dated 06.11.2015, passed by this Hon'ble High Court in the above noted Civil Writ Petition for immediate strict compliance.

Given under my hand and the seal of this Court of 24th day of November, 2015.

BY ORDER OF THE PUNJAB AND HARYANA HIGH COURT AT CHANDIGARH.

Superintendent (WRITS)
for Assistant Registrar

IN THE HIGH COURT FOR THE STATES OF PUNJAB & HARYANA
AT CHANDIGARH
****

C.W.P. No. _____ of

Gopal Singh Soni son of Sh. Jagdish Singh Soni resident of H. No. MCF 07228, Street No. 15, Partap Nagar, Bathinda.

...Petitioner

Versus

1. State of Punjab through Principal Secretary, Department of Education, Punjab Civil Secretariat, Chandigarh.

2. Director Public Instruction (Higher Education), Punjab, Punjab Civil Secretariat, Chandigarh.

3. The Central University of Punjab through its Vice-Chancellor, Bathinda Punjab.

4. Centre for Bio Sciences, through its Centre Co-coordinator, University of Punjab, Bathinda, Punjab.

5. M/s Ranker Security Service Pvt. Ltd., Bathinda 22310, 50 Shanti Nagar, Near GN School, Bathinda, Punjab.

...Respondents

CIVIL WRIT PETITION under Articles [illegible] of the Constitution of India for issuance writ in the nature of Mandamus directing respondents to refrain from dispensing with services of the petitioner working as laboratory technician with respondents No. 3 & 4 [illegible] further directing the respondents not to remove the petitioner from service after the completion of the contract period on 26.09.2015 till regular appointments are made as the petitioner has been working on the said post since 30.08.2011 and the petitioner is sought to be replaced by another employee on contractual/temporary/ ad hoc basis.

AND

Further a writ in the nature of Mandamus directing the respondents to regularize the services of the petitioner on the post of laboratory technician with respondents No. 3 and 4.

AND

It is further prayed that during the pendency of the present writ petition, the petitioner may be allowed to continue on his present post i.e. laboratory technician in Centre for bio Sciences, Central University of Punjab Bathinda.

AND

Any other writ, order or direction which this Hon'ble Court may deem fit and proper in the facts and circumstances of the case may also be issued in favour of the petitioner.

IN THE HIGH COURT FOR THE STATES OF PUNJAB & HARYANA
AT CHANDIGARH
****

C.M. No. [illegible] of
In
C.W.P. No. 20364 of

Gopal Singh Soni

...Petitioner

Versus

State of Punjab & others.

...Respondents

Application seeking permission to place on record the Rejoinder to the written statement filed on behalf of respondent no. 3 along with Annexures P/8 to P/10 and exemption from filing the certified copies of Annexures P/8 to P/10.

RESPECTFULLY SHOWETH:

1. That the aforesaid writ petition is pending adjudication before this Hon'ble Court and is fixed for hearing on 31.10.2015.

2. That after issuance of notice of motion, the respondent no. 3 had filed written statement dated 12.10.2015.

3. That the contents of the aforesaid written statement dated 12.10.2015 are wrong and misleading and the same need to be controverted and the correct facts brought on record for the just and proper adjudication of the matter in issue.

4. That in view of the aforesaid facts and circumstances, filing of Rejoinder to the written statement filed on behalf of respondent no. 3 is necessary and petitioner thus, craves the indulgence of this Hon'ble Court for grant of permission to place on record the Rejoinder to the written statement filed on behalf of respondent no. 3 along with Annexures P/8 to P/10 and exemption from filing the certified copies of Annexures P/8 to P/10.

IN THE HIGH COURT OF PUNJAB AND HARYANA
AT CHANDIGARH

Civil Writ Petition No. 20364 of 2015 (O&M)
Date of decision : November 06, 2015

Gopal Singh Soni .....Petitioner

Versus

State of Punjab and others ....Respondents

CORAM:- HON'BLE MRS. JUSTICE LISA GILL

Present. Ms. Divya Sharma, Advocate
for the petitioner.

Mr. Ashish Sharma, Addl. AG, Punjab.

Mr. K.K. Gupta, Advocate
for respondent No. 3.

***

LISA GILL, J.

C.M. No. 14277 of 2015

Prayer is for placing on record rejoinder to the written statement filed on behalf of respondent No. 3 alongwith Annexures P-8 to P-10. Same is taken on record subject to just exceptions. Filing of certified copies of Annexures P-8 to P-10 is exempted.

Application is disposed of.

Civil Writ Petition No. 20364 of 2015

Prayer in this writ petition is for restraining respondents from dispensing with services of the petitioner

as Laboratory Technician with respondents No. 3 and 4 and with further direction not to relieve him from service till regular appointments are made to the said posts.

It is submitted that the petitioner was appointed to the post of Laboratory Technician on 30.08.2011 after participating in proper selection procedure. Advertisement No. NT-06(2011) was published, pursuant to which petitioner applied and he was called for interview for the post of Technical Assistant. However, letter of appointment (Annexure P-3) issued to the petitioner was for Laboratory Technician on temporary and contractual basis. Petitioner underwent medical fitness test and joined duty as Laboratory Technician on 30.08.2011. Extension of service was afforded vide letter dated 30.08.2012 (Annexure P-4) for a further period of 6 months. He continued to work on the said post being afforded subsequent extensions for periods of six and three months upto 27.09.2015.

Respondent-University issued a notice inviting tenders for outsourcing of multi task services. Bid of respondent No. 5 -- M/s Ranker Security Service Private Limited was accepted by the respondent-University. Petitioner apprehending that further extension would not be afforded to him as he was orally informed that all appointments would be made through the Contractor in future preferred the present writ petition. Specific prayer in the writ petition is that he should not be replaced by another person on contractual basis itself. Notice of motion was issued to the respondents vide

ground.

Mr. Gupta, learned counsel for respondent No. 3 submits that Recruitment Rules namely Cadre Recruitment Rules (Non Teaching Employees), 2015 have been promulgated and University Grants Commission (UGC) has afforded approval to the said rules during the pendency of the present writ petition, therefore, no employee is being appointed on contract basis any longer. Advertisement dated 03.11.2015 has already been issued for filling up available sanctioned vacant posts. In this view of the matter, no right whatsoever accrues to the petitioner.

In view of the subsequent development as pointed out by learned counsel for respondent No. 3, it is apparent that petitioner is not entitled to any indulgence. There is no vested right with an employee appointed on contractual basis to continue on the said post in the wake of the respondent-department proceeding to fill vacancies on regular basis. Petitioner has no right to continue on the said post after expiry of his tenure as per extension given to him.

At this stage, learned counsel for the petitioner submits that petitioner will suffer extreme prejudice inasmuch as he would not be able to apply for the relevant post of Technical Assistant pursuant to advertisement dated 03.11.2015 as the petitioner has become over age. At the time of initial appointment after proper selection in the year 2011, he was within age limit specified, therefore, relaxation be afforded to him on this count.

Mr. Gupta, while referring to Rule 26 of the above said

Rules submits that no such relaxation is permissible in such a case. Rule 26 affords relaxation only as under:-

> 26. **Power to Relax:**
>
> (i) Relaxation in age and experience etc. may be granted to the candidates belonging to the Schedule Caste/Schedule Tribes/OBC/PWD or other reserved categories as per the UGC/Govt. of India guidelines. A certificate to this effect issued from the competent authority should be attached with the prescribed application form. Wherever, relaxation of qualifications including percentage of marks is permitted under the UGC/Govt. of India guidelines, such relaxation shall also be considered in appropriate cases subject to recommendations of the Screening Committee.
>
> (ii) In addition to above, the relaxation in age shall also be given in respect of the following categories as mentioned against each:-

S. No.	*Categories of persons*	*Extent of age relaxation*
1.	Employees of Central University of Punjab	As per GOI rules
2	Employees of Central Government/State Government/Central Universities/UGC maintained Deemed Universities/ Govt./Govt.-aided College/other Central autonomous bodies/organisations/Institutions /Public Sector Undertakings	Relaxation as per Govt. of India norms

Rules, norms and guidelines of Government of India or UGC regarding relaxation of age have been not produced before the Court though it is submitted by learned counsel for the respon-

that no relaxation in age is permissible to the petitioner.

There being no dispute regarding the petitioner being within the specified age limit at the time of his induction in 2011, it is considered just and expedient to direct the respondents to allow relaxation in age if he applies pursuant to advertisement dated 03.11.2015. It is clarified that no benefit whatsoever apart from relaxation of age is being directed by this Court and in case petitioner applies in response to the said advertisement he shall be considered for appointment in accordance with all other rules, regulations and provisions of law.

Present writ petition is, accordingly, disposed of.

(Lisa Gill)
Judge

November 06, 2015
rtc

30/11/15