

**NATIONAL INSTITUTE OF TECHNOLOGY
DURGAPUR**

56TH MEETING OF THE SENATE

*TO BE HELD ON
January 24, 2020
AT 3.00 PM
IN THE SENATE ROOM*



AGENDA NOTES

Item No. 56.1 Confirmation of the Minutes of the 55th Senate Meeting

The 55th Meeting of the Senate was held on 4th September, 2019 at 3.30 PM. the Senate Room of the Institute. The minutes of the said meeting were mailed to all Senate members for their comments (**Annexure 56.1.1**). One comment was received from Prof. I. Basak (**Annexure 56.1.2**).

Item No. 56.2 Action Taken Report

Reference Item No.	Agenda Item	Action Taken on the Resolution
55.2	Action Taken Report	Noted
55.3	To consider issues related to the UG and PG studies	Resolutions duly implemented.
55.4	To consider issues related to the PhD studies	Resolutions duly implemented.
55.5	To discuss issues pertaining to the 15 th Convocation	Resolutions duly implemented.
55.6	To admit foreign students to the UG, PG and PhD programmes under "Study in India" programme	Included in the Agenda item # 56.10.
55.7	To offer joint masters programmes with other universities/national institutes	Included in the Agenda item # 56.14.
55.8	To amend the late fine for return of books to the Library	Resolutions duly implemented.
55.9.1	To consider awarding grace marks to the students who failed in the sixth and eighth semester supplementary and backlog examinations (2018-19)	Resolutions duly implemented. To be discussed further in agenda item # 56.1.

The Senate may consider confirmation of the minutes.

Item No. 56.3 To consider the resolutions of UGAC and PGAC meetings

The Senate may consider the resolutions of UGAC/PGAC meetings held on 24.10.2019, 10.12.2019, 24.12.2019, 14.01.2020 [**Annexure 56.3.1, 56.3.2, 56.3.2.4, 56.3.3, 56.3.4**]

Item No. 56.4 To consider the resolutions of RAC meetings

The Senate may consider the resolutions of RAC meetings held on 24.10.2019, 21.11.2019, 24.12.2019, 21.01.2020. [**Annexure 56.4.1, 56.4.2, 56.4.3, 56.4.3.1, 56.4.4**] (*56.4.4 to be placed on the table*)

Item No. 56.5 To consider the revision of seat matrix and implementation of the revised fee structure for all academic programs from the academic year 2020-2021

The Senate may consider the revision of seat matrix and implementation of the revised fee structure for all academic programs from the academic year 2020-2021 (*To be placed on the table*)

Item No. 56.6 To consider revision in PhD Regulations

Based on suggestions received from the faculty members on the PhD Regulations, a few proposed revisions shall be placed on the table by Chairman, Senate for the consideration of the Senate. The Senate may consider the same.

Item No. 56.7 To decide the further course of action on the MSW program

The Senate may take a decision on the future course of action on the MSW program.

Item No. 56.8 To consider introduction of two new M. Sc. Programs in Life Science and Applied Geology and Geoinformatics from 2020-21

The Senate may consider introducing two new M. Sc. Programs in Life Science and Applied Geology and Geoinformatics from the academic session 2020-21 (Annexures 56.8.1.1, 56.8.1.2, 56.8.1.3, 56.8.2.1, 56.8.2.2, 56.8.2.3).

Item No. 56.9 To consider introduction of the Post-Doctoral Fellowship, Honorary Research Fellow and Multidisciplinary Research Projects

The Senate may consider introducing Post-Doctoral Fellowship and Honorary Research Fellows and Multidisciplinary Research Projects (for the faculty members). [Annexure - 56.9]

Item No. 56.10 To admit foreign students to the UG, PG and PhD programs under "Study in India" program

The Senate may take a decision on the admission of foreign students to the UG, PG and PhD programs under "Study in India" program. (To be placed on the table)

Item No. 56.11 To consider committees for the award of Honoris-causa

The Senate may constitute committees for the award of Honoris-causa and finalize accordingly (Annexure 56.11).

Item No. 56.12 To consider the norms for offering online courses as suggested by the MHRD

The Senate may decide the norms for offering online courses as suggested by the MHRD. (Annexure 56.12).

Item No. 56.13 To consider signing MoUs with academia, industries and research institutions

The Senate may consider signing MoUs with ULVAC Inc., Japan, CGCRI, Kolkata, RUET, Rajshahi, Bangladesh, etc.

Item No. 56.14 To offer joint masters/PhD programs with other foreign/national universities/ institutes/ research organizations

The Senate may consider the norms for offering joint masters/PhD programs with other foreign/ national universities/ institutes/ research organizations (Annexure 56.14).

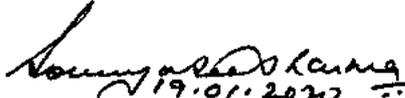
Item No. 56.15 To formulate the Strategic Plan of the Institute

The Senate may formulate the Strategic Plan of the Institute (**Annexure 56.15**).

Item No. 56.16 To discuss the format of students' feedback

The Senate may re-assess the format of students' feedback (**Annexure 56.16**).

Item No. 56.17 Any other matter with the permission of the chair


19.01.2020

Registrar & Secretary, Senate
NIT Durgapur

Date: January 19, 2020

ANNEXURE 56.1.1.

**NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
WEST BENGAL, INDIA**

**55TH SENATE MEETING
DATE: 4TH SEPTEMBER 2019
TIME: 3:30: PM
VENUE: - SENATE HALL**



MINUTES

The meeting was attended by the following members:

<u>Sl.</u>	<u>Name & Department</u>	<u>Capacity</u>
1.	Prof. Anupam Basu Director & Chairman-Senate NIT Durgapur	Chairman
2.	Prof. K. Aikat Department of Biotechnology NIT Durgapur	Member
3.	Prof. (Ms.) Surabhi Chaudhuri Head, Department of Biotechnology NIT Durgapur	Member
4.	Prof. S. S. Mukhopadhyay Department of Biotechnology NIT Durgapur	Member
5.	Prof. B.P. Mukhopadhyay Department of Chemistry NIT Durgapur	Member
6.	Prof. D. Sukul Department of Chemistry NIT Durgapur	Member
7.	Prof. A.K. Patra Department of Chemistry NIT Durgapur	Member
8.	Prof. M. Maji Department of Chemistry NIT Durgapur	Member
9.	Prof. Rajnarayan Saha Department of Chemistry NIT Durgapur	Member
10.	Prof. S.C. Moi Department of Chemistry NIT Durgapur	Member
11.	Prof. P. Gupta Department of Chemical Engineering NIT Durgapur	Member
12.	Prof. K. C. Ghanta Department of Chemical Engineering NIT Durgapur	Member

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| 13. | Prof. T. Mandal
Department of Chemical Engineering
NIT Durgapur | Member |
| 14. | Prof. A.K. Sadhukhan
Department of Chemical Engineering
NIT Durgapur | Member |
| 15. | Prof. S. Dutta
Department of Chemical Engineering
NIT Durgapur | Member |
| 16. | Prof. Gopinath Halder
Department of Chemical Engineering
NIT Durgapur | Member |
| 17. | Prof. D.K. Singha Roy
Department of Civil Engineering
NIT Durgapur | Member |
| 18. | Prof. A. Das
Department of Civil Engineering
NIT Durgapur | Member |
| 19. | Prof. S. Saha
Department of Civil Engineering
NIT Durgapur | Member |
| 20. | Prof. V.K. Dwivedi
Department of Civil Engineering
NIT Durgapur | Member |
| 21. | Prof. S. Bhattacharya
Department of Civil Engineering
NIT Durgapur | Member |
| 22. | Prof. A.K. Banik
Department of Civil Engineering
NIT Durgapur | Member |
| 23. | Prof. A.K. Samanta
HoD, Department of Civil Engineering
NIT Durgapur | Member |
| 24. | Prof. (Mrs.) T. Pal
Department of Computer Science & Engineering
NIT Durgapur | Member |
| 25. | Prof. D. Nandi
Department of Computer Science & Engineering
NIT Durgapur | Member |

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| 26. | Prof. S. Choudhury
Department of Computer Science & Engineering
NIT Durgapur | Member |
| 27. | Prof. Avijan Dutta
Department of Management Studies
NIT Durgapur | Member |
| 28. | Dr. Neelotpaul Banerjee
Department of Management Studies
NIT Durgapur | Member |
| 29. | Prof. A.K. Bhattacharjee
Department of Electronics & Communication Engineering
NIT Durgapur | Member |
| 30. | Prof. G. K. Mahanti
Department of Electronics & Communication Engineering
NIT Durgapur | Member |
| 31. | Prof. A. K. Mal
Department of Electronics & Communication Engineering
NIT Durgapur | Member |
| 32. | Prof. B. Maji
Department of Electronics & Communication Engineering
NIT Durgapur | Member |
| 33. | Prof. S.S. Thakur
Department of Electrical Engineering
NIT Durgapur | Member |
| 34. | Prof. N.K. Roy
Department of Electrical Engineering
NIT Durgapur | Member |
| 35. | Prof. S. Banerjee
Department of Electrical Engineering
NIT Durgapur | Member |
| 36. | Prof. P. Acharjee
Department of Electrical Engineering
NIT Durgapur | Member |
| 37. | Prof. T. K. Saha
Department of Electrical Engineering
NIT Durgapur | Member |
| 38. | Prof. S. N. Mahato
Department of Electrical Engineering
NIT Durgapur | Member |

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| 39. | Prof. C. Koley
Department of Electrical Engineering
NIT Durgapur | Member |
| 40. | Prof. K. Adhikari
Department of Earth & Environmental Sciences
NIT Durgapur | Member |
| 41. | Prof. P.P. Sengupta
Department of Humanities & Social Sciences
NIT Durgapur | Member |
| 42. | Dr. J. Banerjee
HoD, Department of Humanities & Social Sciences
NIT Durgapur | Member |
| 43. | Dr. Pinaki Pal
HoD, Department of Mathematics
NIT Durgapur | Member |
| 44. | Dr. (Mrs) Seema Sarkar (Mondal)
Department of Mathematics
NIT Durgapur | Member |
| 45. | Prof. Samarjit Kar
Department of Mathematics
NIT Durgapur | Member |
| 46. | Prof. I. Basak
Dean (Academic)
NIT Durgapur | Member |
| 47. | Prof. B. Halder
Dean (SW)
NIT Durgapur | Member |
| 48. | Prof. Amar Nath Mullick
Department of Mechanical Engineering
NIT Durgapur | Member |
| 49. | Prof. N. B. Hui
Department of Mechanical Engineering
NIT Durgapur | Member |
| 50. | Prof. A.B. Puri
Department of Mechanical Engineering
NIT Durgapur | Member |
| 51. | Prof. S.S. Roy
Department of Mechanical Engineering
NIT Durgapur | Member |

52.	Prof. N. Banerjee Dean (AAO) NIT Durgapur	Member
53.	Prof. A. Layek HoD, Department of Mechanical Engineering NIT Durgapur	Member
54.	Prof. M.M. Ghosh Department of Metallurgical & Materials Engineering NIT Durgapur	Member
55.	Prof. K. S. Ghosh Department of Metallurgical & Materials Engineering NIT Durgapur	Member
56.	Prof. P. Kumbhakar Department of Physics NIT Durgapur	Member
57.	Prof. A.K. Meikap Department of Physics NIT Durgapur	Member
58.	Prof. Amit Kr. Chakraborty Department of Physics NIT Durgapur	Member
59.	Mr. Soumya Sen Sharma Registrar NIT Durgapur	Secretary

Prof. Siddhartha Sen, Prof. A Raychaudhuri, Prof. (Mrs.) S. Dasgupta, Sri S. Chatterjee, Mr. B. Bhattacharya, Mr. S. Bhowmik, Ms. B. Arshad, Prof. S. Chattopadhyay, Prof. J. Maity, Prof. K. Bhattacharya, Prof. A. Dey, Prof. Dalia Dasgupta Mandal, Prof. P. Pal, Prof. P. Ray, Prof. (Mrs.) S. Roy, Prof. S. Nandi, Prof. Mousumi Roy, Prof. S. Kundu, Prof. R. Mahapatra, Prof. R. Ghatak, Prof. S. Ghosh, Prof. (Mrs.) Kajla Basu and Prof. K. S. Ghosh could not attend the meeting and were granted leave of absence.

The Chairman welcomed the Senate members to the meeting and requested Secretary, Senate to present the agenda of the 55th Senate meeting.

Item No. 55.1 Confirmation of the Minutes of the 54th Senate Meeting

The minutes of the 54th Senate meeting were confirmed by the Senate.

Item No. 55.2 Action Taken Report

The Senate of the Institute noted the Action Taken Report with the following addendum.

- 54.11 The overhead charges remitted to the department as per the CEC norms shall be shared in the ratio of 4:1 between the High Voltage Laboratory and the parent

department for the training programmes conducted by the High Voltage Laboratory.

Item No. 55.3 **To consider issues related to the UG and PG studies**

The Senate approved/ratified the resolutions of UGAC/PGAC meetings held on 14/08/2019, 29/08/2019.

Item No. 55.4 **To consider issues related to the PhD studies**

The award of PhD degree to 26 candidates and the registration of 12 candidates for the PhD program were approved by the Senate (Annexures I and II). The Senate also approved/ratified the minutes of the RAC meetings held on 29/08/2019.

Item No. 55.5 **To discuss issues pertaining to the 15th Convocation**

The Senate endorsed conferring B. Tech degrees to 768, M. Tech degrees to 205 M. Tech students, MBA degrees to 28 students, MCA degrees to 33 students, M.Sc. degrees to 30 students, MSW degrees to 10 students and Ph.D. degrees to 79 students.

It was informed that the Prof. Bikash Sinha and Prof. Indranil Manna have kindly consented to grace the 15th Convocation as the Chief Guest and the Guest of Honour respectively, which the Senate endorsed. It was also noted that Prof. Kamanio Chattopadhyay and Mr. Sumant Bhargavan, who were nominated by the Senate for conferring of the Distinguished Alumnus Award 2019 for Academic & Research and Corporate & Industry respectively, have kindly accorded their sent consent. The format of the awarded certificate was also approved by the Senate.

Item No. 55.6 **To admit foreign students to the UG, PG and PhD programmes under "Study in India" programme**

The Senate resolved that the Institute shall participate in the "Study in India" programme and EdCIL Ltd will be intimated accordingly. Further details on the report submitted by the committee will be discussed in the next Senate meeting.

Item No. 55.7 **To offer joint masters programmes with other universities/national institutes**

The details on the report submitted by the committee will be discussed in the next Senate meeting. It was resolved that Humanities and Social Sciences will also be included in the report for offering joint programmes. Only two institutes /universities will be considered for offering a joint programme.

Item No. 55.8 **To amend the late fine for return of books to the Library**

The Senate resolved that the late fine for return of books to the Library after six months shall be Re. 1 per day per book for one month and Rs. 2 per day per book beyond one month. In case of non-return, the Library membership of the student shall be cancelled after three months. Possibility will be explored to extend reprographic facility to the students at the Library on chargeable basis.

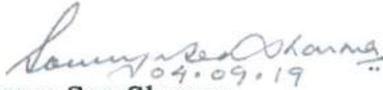
Item No. 55.9 **Any other matter with the permission of the chair**

55.9.1 **To consider awarding grace marks to the students who failed in the sixth and eighth semester supplementary and backlog examinations (2018-19)**

The Senate resolved that up to 4 grace marks will be awarded to the students who have failed in not more than one course in the sixth and

eighth semester supplementary and backlog examinations (2018-19). This was considered as a special case keeping in view the placement and career opportunities of the students and should be treated as an exception without any precedence whatsoever in the future. It was further resolved that the certificate of any student who becomes eligible for the degree in 2018-19 on account of having passed due to the award of grace marks be sent to the respective student by speed post.

The meeting ended with a vote of thanks to the chair.


04.09.19
Soumya Sen Sharma
Registrar & Secretary, Senate
NIT Durgapur


Anupam Basu
Director
& Chairman, Senate
NIT Durgapur

Place: NIT Durgapur
Date: 04/09/2019

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

LIST OF PHD DEGREE AWARDEES

SL.	REGN. NO	DEPT.	NAME OF THE SCHOLAR	NAME OF THE SUPERVISOR	DATE OF AWARD
1	NITD/PhD/PH/2015/00693	PH	DHOUMENDRA MANDAL	DR. M. K. MANDAL	25.07.2019
2	NITD/PhD/ME/2014/00517	ME	ANUP KUMAR	DR. A. LAYEK	26.07.2019
3	NITD/PhD/CE/2016/00747	CE	MOHAMED AHMED GALAL	DR. A. K. BANIK	29.07.2019
4	NITD/PhD/EE/2015/00621	EE	TAPAS KUMAR MAJI	DR. P. ACHARJEE	31.07.2019
5	NITD/PhD/CS/2015/00652	CS	SRINIVASAN A	1. PROF. G. SANYAL 2. DR. P. BHATTACHERJEE, CSIR-CMERI, DURGAPUR	05.08.2019
6	NITD/PhD/EE/2015/00671	EE	TUSHNIK SARKAR	1. PROF. S. BANERJEE 2. DR. K. M. HOSSAIN (B. C. ROY ENGINEERING COLLEGE)	06.08.2019
7	NITD/PhD/MS/2014/00570	MS	MALAY BHATTACHARJEE	DR. G. BANDYOPADHYAY	07.08.2019
8	NITD/PhD/EE/2016/00773	EE	INDRAYUDH BANDYOPADHYAY	1. DR. C. KOLEY 2. PROF. P. PURKAIT	09.08.2019
9	NITD/PhD/EE/2014/00530	EE	BIPLAB SATPATI	1. DR. C. KOLEY 2. DR. S. DATTA, MAKAUT, W.B.	14.08.2019
10	NITD/PhD/CE/2016/00788	CE	SUMANTA RAKSHIT	1. DR. S. PAL 2. PROF. S. BHATTACHARYYA	16.08.2019
11	NITD/PhD/MA/2016/00708	MA	ANINDITA KUNDU	1. DR. G. PANIGRAHI 2. DR. B. DAS, SKBU, PURULIA 3. PROF. M. MAITI, VIDYASAGAR UNIVERSITY, MEDINIPUR	19.08.2019

SL.	REGN. NO	DEPT.	NAME OF THE SCHOLAR	NAME OF THE SUPERVISOR	DATE OF AWARD
12	NITTD/PhD/PH/2014/00507	PH	MAHASWETA BANERJEE	DR. S. BASU	20.08.2019
13	NITTD/PhD/CHE/2014/00554	CH	SUSHOVAN SEN	PROF. S. DUTTA	21.08.2019
14	NITTD/PhD/ME/2013/00427	ME	SIBENDRA KUMAR GHARAI	DR. A. LAYEK	22.08.2019
15	NITTD/PhD/MME/2014/00560	MM	AATREYEE SARKAR	1. DR. S. BERA 2. DR. A. K. CHAKRABORTY	22.08.2019
16	NITTD/PhD/ME/2012/00334	ME	DILIP KUMAR ADHWARJEE	1. DR. M.C. MAJUMDER 2. PROF. N. BANERJEE	22.08.2019
17	NITTD/PhD/ME/2015/00675	ME	ASHOK KUMAR BANDYOPADHYAY	DR. M.C. MAJUMDER	23.08.2019
18	NITTD/PhD/CSE/2013/00400	CS	SUBHENDU BARAT	DR. T. DE	23.08.2019
19	NITTD/PhD/CH/2014/00527	CH	SOHINI GUHA THAKURA	DR. J. CHAKROBARTY	23.08.2019
20	NITTD/PhD/ECE/2014/00569	EC	SOU MEN MALLICK	1. DR. R. KAR 2. DR. D. MANDAL 3. PROF. S.P. GHOSHAL	24.08.2019
21	NITTD/PhD/CSE/2015/00592	CS	PRIYANKA DAS	DR. T. DE	26.08.2019
22	NITTD/PhD/ECE/14/00567	EC	PARTHA SARATHI PAL	1. DR. R. KAR 2. DR. D. MANDAL 3. DR. S. P. GHOSAL	27.08.2019
23	NITTD/PhD/ME/2012/00375	ME	P. ANITHA	DR. M.C. MAJUMDER	27.08.2019
24	NITTD/PhD/HSS/2016/00728	HS	INDRAJIT PATRA	DR. S.K. RAI	27.08.2019
25	NITTD/PhD/CS/2015/00650	CS	RAVI KANT KUMAR	PROF. G. SANYAL	28.08.2019
26	NITTD/PhD/CHE/2013/00442	CH	CHAKRABORTY PRASENJIT	PROF. G. HALDER	28.08.2019

**NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
LIST OF PHD REGISTRATION**

SL.	NAME	DEPT.	SUPERVISOR	DATE OF REGISTRATION
1	MADHUMITA SARDAR	CS	DR. D DAS	18.07.2019
2	MONALISA MISHRA	CS	DR. P. CHOUDHURY	22.07.2019
3	ARUNABH SEN	CE	1. DR. D. DAS 2. PROF. S. CHAKRA- BORTY, IEST, SHIBPUR	25.07.2019
4	ASIM KUMAR DAS	ME	DR. S. RANA	26.07.2019
5	RAYANI PRAVEEN KUMAR	CS	DR. S. CHANGDER	26.07.2019
6	SUDHIR KUMAR BARIK	BT	DR. K. AIKAT	26.07.2019
7	MONALISA SARDAR	CS	DR. T. PAL	26.07.2019
8	SANJIT BHOWMICK	MA	1. DR. S. BAGCHI 2. DR. R. K. BANDI	30.07.2019
9	MADHAB DHALI	EC	DR. D. MANDAL	02.08.2019
10	ANITHA BHUKYA	EE	DR. C. KOLEY	21.08.2019
11	PRASHANT KUMAR	EE	DR. S. HALDER	21.08.2019
12	PARTHA SARATHI BERA	CY	DR. T. K. SAHA	23.05.2019

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10-10-19

NIT Durgapur Mail -

ANNEXURE 56.1.2



NIT
DURGAPUR

Director NIT Durgapur <director@admin.nitdgp.ac.in>

ANNEXURE 56.1.2

IDM_55th Senate meeting item no. 55.09.1

2 messages

Registrar Office <registrar.office@admin.nitdgp.ac.in>

Wed, Sep 25, 2019 at 3:40 PM

To: "Dean (Acad.)" <deanac@admin.nitdgp.ac.in>

Cc: Director NIT Durgapur <director@admin.nitdgp.ac.in>, Registrar NIT Durgapur <registrar@admin.nitdgp.ac.in>, Parthapratim Gupta <parthapratim.gupta@che.nitdgp.ac.in>

Sir,

Please find the attached file.

Thanks & Regards,

Registrar Office
NIT, Durgapur - 713209
West Bengal, India

IDM_55 Senate meeting_item no 55.09.1.pdf
314K

Indrajit Basak <deanac@admin.nitdgp.ac.in>

Thu, Oct 3, 2019 at 11:42 AM

To: Registrar Office <registrar.office@admin.nitdgp.ac.in>

Cc: Director NIT Durgapur <director@admin.nitdgp.ac.in>, Registrar NIT Durgapur <registrar@admin.nitdgp.ac.in>, Parthapratim Gupta <parthapratim.gupta@che.nitdgp.ac.in>, "Anupam Basu (অনুপম বসু)" <anupambas@gmail.com>, Saradindu Ghosh <sgosh.ee@gmail.com>, Partha Sarathee Bhowmik <psbhowmik@gmail.com>, Nirmal Baran Hui <nirmal.hui@me.nitdgp.ac.in>, Subhankar Roy Barman <subhankarroy.barman@bt.nitdgp.ac.in>, Dhrubajyoti Ray <draca@admin.nitdgp.ac.in>

Dear Sir,

The following is my observations on the IDM and the corresponding resolution of the 55th Senate. Firstly, I must apologise for the late response and could not give proper attention to the resolution due to the pressure of the 15th convocation.

1) There was no written presentation from any student or any agenda item on this issue in the senate. If the resolution is challenged by public, it will be difficult to defend.

2) There was a special supplementary examination on July, 2019 which is an extension of 2018-19 session, and should be included in the senate resolution and in the IDM to extend the benefits to larger number of students.

Thanking you,

Dr. Indrajit Basak

Professor, Mechanical Engineering &
Dean (Academic)
National Institute of Technology Durgapur
Mahatma Gandhi Avenue, Durgapur - 713209, INDIA
Cell: +91 9434788109
Website: www.nitdgp.ac.in

[Quoted text hidden]

*PPG + Registrar
For necessary
in cooperation
for.
10/10/19*

राष्ट्रीय प्रौद्योगिकी संस्थान दुर्गापुर
महात्मा गांधी एवेन्यू, दुर्गापुर- 713209, (पश्चिम बंगाल), भारत
NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
MAHATMA GANDHI AVENUE, DURGAPUR – 713 209, INDIA

No.NITD/Reg/IDM-03/55th-Senate

25th September, 2019

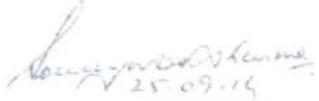
Inter- Departmental Memo

From: Registrar

To: Dean (Academic)

In its 55th Senate meeting held on 4th September, 2019, it was resolved that up to 4 grace marks will be awarded to the students who have failed in not more than one course in the sixth and eighth semester supplementary and backlog examinations (2018-19). This was considered as a special case keeping in view the placement and career opportunities of the students and should be treated as an exception without any precedence whatsoever in the future. It was further resolved that the certificate of any student who becomes eligible for the degree in 2018-19 on account of having passed due to the award of grace marks be sent to the respective student by speed post. (Item no. 55.09.1)

This is for your information and necessary action.


25.09.19
Registrar

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

INDIA
ACADEMIC SECTION

ANNEXURE 56.3.1

ANNEXURE - 56.3.1
Date: 24.10.2019

Minutes of the meeting of UGAC and PGAC held jointly on 24.10.2019 (Thursday) at 03.00 pm in the meeting room of Academic Section.

The following members were present in the meeting

1.	Prof. I. Basak	-	Dean (Academic)
2.	Prof. A. K. Meikap	-	Dean (R & C)
3.	Prof. S. Mukhopadhyay	-	Deptt of BT
4.	Prof. S. Choudhury	-	HOD, BT
5.	Prof. P. Kumbhakar	-	HOD, Physics
6.	Prof. S. Choudhuri	-	HOD, BT
7.	Dr. D. Chakraborty	-	For, HOD, HSS
8.	Dr. N. Banerjee	-	HOD, MS
9.	Prof. C. Koley	-	HOD, EE
10.	Prof. A. K. Samanta	-	HOD, CE
11.	Prof. A. Layek	-	HOD, ME
12.	Prof. T. Pal	-	HOD, CSE
13.	Prof. G. Halder	-	HOD, ChE
14.	Prof. K. Adhikari	-	HOD, HSS
15.	Dr. P. Pal	-	HOD, Mathematics
16.	Prof. R. N. Saha	-	HOD, Chemistry
17.	Prof. N. B. Hui	-	Asso. Dean (A & E)
18.	Dr. P. S. Bhowmik	-	Asso. Dean (A & E)
19.	Dr. S. Roy Barman	-	Asso. Dean (A & E)

The Chairman welcomed the members to the meeting and the agenda was placed.

Item # 1 Confirmation of the minutes of the meeting of PGAC held on 29.08.2019 (Thursday).

The minutes of the PGAC meeting held on 29.08.2019 were confirmed.

Item # 2 To consider withdrawal of Utsav De (Roll No. 19CE4110, Reg. No. 19P10111) from M. Tech Programme.

The matter of withdrawal by the respective student is accepted. The scholarship will be stopped. The Institute fee and Hostel fee can not be refunded except the amount that he paid in excess (if any) at the time of admission. Institute caution money and Mess fee on prorata basis will be refunded to the bank account of the individual student subject to return of original bonafide certificate and admission letter provided to him at the time of admission and with submission of No-Due Certificate.

Item # 3 To consider introduction of new elective "Marketing to the Rural and Bottom of Pyramid Market (MS9074) from Even Semester 2019-2020.

The subject code MS9074 is recommended for approval. The subject name and the course content will be submitted by the respective departmental committee.

Bans
24/10/19

Item # 4 To consider the matter regarding incomplete result of Shubhajyoti Mondal (Roll No. 18G80027) in WSS51, Akhilesh Karan Chaudhari (Roll No. 18F80094) in XXS52 and Gaurav Bardolui (Roll No. 16B80046) in EA52.

The students are advised to undergo compensatory classes in WSS51 during 21.10.2019 to 21.11.2019, so that the assessment is completed and marks are sent to the Academic Section by 22.11.2019. The result of Gaurav Bardolui (Roll No. 16B80046) in EA52 will be effective retrospectively.

Item # 5 To consider the cases of Susanta Soren and Om Saswat Sahoo of 1st year B. Tech Programme who could not appear Alternative Mid Term Examination - Odd Semester 2019-2020 as they were admitted in hospital.

The students are advised to contact the subject teachers so that they can write the examination within 15.11.2019.

Item # 6 To consider the final report and recommendation of Academic committee to introduce 2years M. Sc Programme in Applied Geology and Geoinformatics from 2020-21 academic session under Department of Earth and Environmental Studies.

The matter is recommended in principle and referred to the Senate for further discussion with regard to model curricula, eligibility criteria and mode of entry.

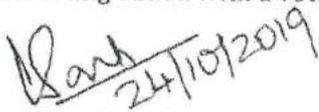
Item # 7 To consider the proposal to introduce a 2 year M. Sc Programme in Life Science from 2020-21 academic session under Department of Biotechnology.

The matter is recommended in principle and referred to the Senate for further discussion with regard to model curricula, eligibility criteria and mode of entry.

Item # 8 To consider the resolution of DAC, Management Studies held on 24.09.2019 regarding admission of MBA Programme 2020 of the Institute.

The matter is referred back to the Department for reconsideration on eligibility criteria.

The meeting ended with a vote of thanks to the Chair.


Dean (Academic)

Date: 24.10.2019

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
INDIA

ANNEXURE 56.3.2

ACADEMIC SECTION

Date: 10.12.2019

Minutes of the meeting of UGAC and PGAC held jointly on 10.12.2019 (Tuesday) at 11.00 am in the meeting room of Academic Section.

The following members were present in the meeting

1.	Prof. I. Basak	-	Dean (Academic)
2.	Dr. G. Sarkar	-	Deptt of CSE
3.	Prof. S. Choudhuri	-	HOD, BT
4.	Dr. M. K. Mandal	-	Deptt of CHE
5.	Dr. J. C. Barman	-	Deptt of EE
6.	Dr. A. Goswami	-	Deptt of ME
7.	Dr. D. Chakraborty	-	Deptt of HSS
8.	Dr. A. De	-	Deptt of MS
9.	Dr. K. Mandal	-	Deptt of MS
10.	Dr. N. Banerjee	-	HOD, MS
11.	Dr. P. S. Bhowmik	-	Asso. Dean (A & E)

The Chairman welcomed the members to the meeting and the agenda was placed.

Item # 1 Confirmation of the minutes of the meeting of PGAC held on 21.11.2019 (Thursday).

The minutes of the PGAC meeting held on 21.11.2019 were confirmed.

Item # 2 To consider the publication of results of 8th Semester Examination 2018-2019 of Tathagata Ghosh (Roll No. 15/ME/27) and Poulomi Das (15/MM/27) which were kept withheld as punishment for indiscipline acts.

The withheld results were recommended for publication. Tathagata Ghosh (Roll No. 15/ME/27) passed with first class obtaining CGPA of 6.73 and Poulomi Das (15/MM/27) passed with first class obtaining CGPA of 7.15. The Degree will be conferred in 16th Convocation.

Item # 3 To consider the matter regarding -

- The examination and its evaluation of those students who were debarred from Odd Semester Regular Examination 2019-2020 due to shortage of attendance.
- The appeal of Tanvi Tejaswini (17CS8070) who had to leave the examination hall under medical compulsion (with medical certificate) on 30 / 11 / 2019 in the theory paper of DBMS (CSC502)
- Two students (Roll No. 16CS8037 and 16CS8038) were debarred in the course CSE723 in B. Tech. 7th Semester end term regular examination, 2019-20 as their attendance was below 25% in that course. Resolved that they will be allowed to attend compensatory classes to make up the shortfall and will be allowed to appear in subsequent supplementary examinations on clearance from the course teacher. The grade obtained in that examination will be recorded by reduction of two grades, but not below P.

Das
10/12

- b) Tanvi Tejaswini (17CS8070) left the examination hall under medical compulsion (with medical certificate) on 30/11/2019 be cancelled and she will be allowed to appear in supplementary examination under medical ground. The issue cannot be cited as precedence in future.

Item # 4 To consider the matter regarding the absence from the Odd Semester Regular Examination 2019 - 2020 of the following students on medical reasons.

- | | |
|---|------------------|
| • Alik Sarkar (Roll No. 17CS8026) | - All papers |
| • Gagan Prasad Gautam (Roll No. 18ME8143) | - MEC303 |
| • Vishal V Mangade (Roll No. 19E80038) | - All papers |
| • Ankan Das (Roll No. 16CS8025) | - All papers |
| • Phalak Tiwari (Roll No. 17MM8009) | - All papers |
| • Satveer Singh (Roll No. 17EE8084) | - All papers |
| • Abhishek Narayan Sarkar (Roll No. 18EC8014) | - ECC301, ECC302 |
| • Tiyaasha Ghosh (Roll No. 18CH8003) | - CHC303, CYC331 |
| • Tiyaas De (Roll No. 17EE8007) | - EE504 |
| • Anshuman Jha (Roll No. 17ME8135) | - MEC501 |
| • Biswajit Rout (18EE8013) | - ECC331 |
| • Abhishek Kumar Bauri (19MA4110) | - MA1001, MA9011 |

The matters are approved and the students are allowed to appear in the supplementary examination within the framework of clauses of the UG regulations.

Item # 5 To consider cancellation of admission of

- Gourav Chatterjee (Roll No. 19B80034, Reg. No. 19U10266)
- Saptaparna Patra (Roll No. 18B80076, Reg. No. 19U10602)
- Somnath Chakraborty (Roll No. 19G80081, Reg. No. 19U10647)

The matters of withdrawals by the respective students are accepted. The Institute fee and Hostel fee will not be refunded except the amount that they paid in excess at the time of admission. Institute caution money and Mess fee on prorata basis will be refunded to the bank account of the individual student subject to return of original bonafide certificate and admission letter provided to them at the time of admission and submission of No Dues Certificate.

Item # 6 To consider the request of Abhirup Bose (Roll No. 15/ME/135) on procedure of drop out from the programme.

Resolved that, Abhirup Bose (Roll No. 15/ME/135) will be intimated to present his case, so that the matter can be dealt sympathetically and appropriately.

Item # 7 To consider the matter regarding mental and physical illness of Abhirup Sikdar (Roll No. 16EE8015) and re-admission in 7th Semester during 2020-2021 session.

Abhirup Sikdar (Roll No. 16EE8015) is allowed to take re-admission in 7th Semester during 2020-2021 session subject to fulfilment of conditions (fit certificate and payment of fee).

Item # 8 To consider the matter regarding illness of Prajata Roy (Roll No. 18CS8006) and re-admission in 3rd Semester during 2020-2021 session.

Prajata Roy (Roll No. 18CS8006) is allowed to take re-admission in 3rd Semester during 2020-2021 session subject to fulfilment of conditions (fit certificate and payment of fee).

Item # 9 To consider the matter regarding illness of Shubham Kumar (Roll No. 18ME8155) and re-admission in 3rd Semester during 2020-2021 session.

Shubham Kumar (Roll No. 18ME8155) may be allowed to take re-admission in 3rd Semester during 2020-2021 session subject to fulfilment of conditions (fit certificate and payment of fee).

Item # 10 To consider introduction of new PG elective course "Physical and Finite Difference Based Modelling Approaches in Metallurgy" with Code: MT90XX for M. Tech programme in Metallurgical and Materials Engineering.

The introduction of the course is approved from even semester, 2019-20. The MME Department is requested to provide proper course code according to practice and to intimate it to the Academic Section.

Item # 11 To consider the appeal of Sarita Kumari (Roll No. 18CE4204) regarding payment of Institute fee as Part-Time student.

Sarita Kumari (Roll No. 18CE4204) has to register each semester by paying the fee in full in accordance with the fee structure.

Item # 12 To consider the matter regarding admission in M. Tech programme for the Armed Forces Officers under Post Graduate Training Scheme 2020-22.

The matter of admission in M. Tech programme for the Armed Forces Officers under Post Graduate Training Scheme 2020-22 is recommended for approval under sponsored category from the Academic Year 2020-2021.

Item # 13 To consider the matter of MBA admission 2020.

The matter is recommended for approval.

Item # 14 To consider the matter of conversion of status of studentship of Dhiraj Kumar Singh (Roll No. 18EE4117) due to his employment at TATA Steel Ltd.

The matter is approved, subjected to submission of no objection certificate from the prospective employer with regard to continuation of studentship. The scholarship will be stopped from the date of joining to job. The third and final semester will be evaluated and result will be published in the academic session 2020-2021.

Item # 15 To consider the matter of transfer of credits on SWAYAM courses.

Resolved that

- a) A student should take permission from the Department before joining courses in NPTEL / MOOCS / GIAN / SWAYAM programme and intimate the same to the Academic Section.
- b) Credits earned from such courses will be additional in nature and will not be computed for determining academic performance like calculation of CGPA / SGPA, award of gold medal etc.

Item # 16 (Any other matter)

To consider the matter of the backlog students, who have completed final semester.

The house discussed the matter in detail and noticed that some student will not be able to complete the programme in stipulated maximum SIX years, if they are allowed to appear only two backlog course in a semester examination. Secondly, the students do not have any regular course to appear in the examination after final semester. Also, to

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collect the semester registration fees beyond regular semesters are causing undue financial burden to their guardians.

It is proposed that

- i) Such students will be allowed to maximum of FOUR Backlog papers per semester (Odd or Even) subject to possibility in the examination schedule.
- ii) Only Institute fees (other than tuition fee and Hostel fee) will be collected from these students to appear in the backlog examination in each semester.
- iii) These students will not be permitted in the hostel beyond final semester and they have to make their own arrangement for lodging and food during the backlog examination.

The issue may be further discussed and decided in the Senate and consequent amendment of the UG Regulation.

The meeting ended with a vote of thanks to the Chair.

Bank
10/12/2019

Dean (Academic)

Date: 10.12.2019

ANNEXURE 56.3.2.4

ANNEXURE 56.3.2.4

Date: 18.11.2019

To,
Prof. I. Basak
Dean Academic,
NIT,
Durgapur

Sub: MBA Admission 2020

Sir,

In reference to item no.8 as mentioned in the minutes of the meeting of UGAC and PGAC held jointly on 24.10.2019, please find enclosed the document related to MBA Admission 2020. I request you to kindly include the matter related to MBA Admission 2020 in the next UGAC and PGAC meeting.

Regards,



Neelotpal Banerjee

HOD, DMS

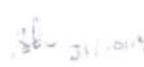
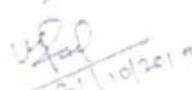
Enclosed:

1. Extract from the resolutions taken up in the DAC meeting held on 31.10.2019
2. Supporting documents

Department of Management Studies
National Institute of Technology, Durgapur

Extract from the resolutions taken up in the DAC meeting held on 31.10.2019 (Thursday) in the Computer Lab, DMS.

Members present:

1. Dr. Neelotpal Banerjee (HOD)  31/10/19
2. Prof. Avijan Dutta
3. Prof. Mousumi Roy  31.10.19
4. Dr. Gautam Bandyopadhyay  31/10/19
5. Dr. Kaushik Mandal
6. Dr. Anupam De  31.10.19.
7. Mr. Subhadip Sarkar  31.10.19
8. Dr. Durba Pal
9. Dr. Amlan Ghosh  31/10/19
10. Dr. Ujjwal Kanti Paul  31/10/2019

Resolution no.1: It is resolved that for MBA Admission 2020, the eligibility criteria will remain same as decided in the DAC meeting held on 24.09.2019. A candidate graduated or in final year of graduation in 2020 can apply for MBA program of NIT Durgapur for the session 2020-2022 provided he/she has a valid CAT/CMAT scores from CAT to be held in November, 2019 or CMAT to be held in January, 2020, and has at least 55% of total marks in graduation.

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

INDIA

ACADEMIC SECTION

ANNEXURE 56-3-3

Date 24.12.2019

Minutes of the meeting of UGAC and PGAC held jointly on 24.12.2019 (Tuesday) at 11.00 am in the meeting room of Academic Section.

The following members were present in the meeting

1.	Prof. I. Basak	-	Dean (Academic)
2.	Prof. S. Choudhuri	-	HOD, BT
3.	Prof. G. Halder	-	HOD, CHE
4.	Dr. S. N. Mahato	-	For HOD, EE
5.	Prof. A. Layek	-	HOD, ME
6.	Dr. U. K. Pal	-	For HOD, MS
7.	Dr. S. Bagchi	-	For HOD, Mathematics
8.	Prof. K. Adhikari	-	HOD, EES
9.	Prof. A. K. Mal	-	HOD, ECE
10.	Prof. S. Bhattacharjee	-	For HOD, CE
11.	Dr. S. Ghosal	-	For HOD, Chemistry
12.	Prof. P. Kumbhakar	-	HOD, Physics
13.	Dr. P. S. Bhowmik	-	Asso. Dean (A & E)
14.	Prof. N. B. Hui	-	Asso. Dean (A & E)
15.	Dr. S. Roy Barman	-	Asso. Dean (A & E)

The Chairman welcomed the members to the meeting and the agenda was placed.

Item # 1 Confirmation of the minutes of the meeting of PGAC held on 10.12.2019 (Tuesday).

The minutes of the PGAC meeting held on 10.12.2019 were confirmed.

Item # 2 To consider the publication of result of Odd Semester Regular / Backlog Examination 2019-2020 and incomplete result of Shubhajyoti Mondal (Roll No. 18G80027) in WSS51, Akhilesh Karan Chaudhari (Roll No. 18F80094) in XXS52 and Gaurav Bardolui (Roll No. 16B80046) in EA52.

The result of Even Semester Regular / Backlog Examination 2019-2020 for all programmes and incomplete result of Shubhajyoti Mondal (Roll No. 18G80027) in WSS51, Akhilesh Karan Chaudhari (Roll No. 18F80094) in XXS52 and Gaurav Bardolui (Roll No. 16B80046) in EA52 are placed and are recommended for publication.

Item # 3 To consider the matter related to inclusion of the following point in existing regulations.

- CGPA to Percentage conversion formula in the result of the students.
- The examination and its evaluation of those students who were debarred from Odd Semester Regular Examination 2019-2020 due to shortage of attendance.

- The matter is to be incorporated in the regulation on approval from the Senate.
- Resolved that they will be allowed to attend compensatory classes to make up the shortfall and will be allowed to appear in subsequent supplementary examinations on clearance from the course teacher. The grade obtained in that examination will be recorded by reduction of two grades, but not below P.

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24/12/2019

Item # 4 To consider the matter regarding the absence from Odd Semester Regular Examination 2019-2020 for Aman Agarwal (Roll No. 18ME8007) in MEC303, PHC333, MEC304 and Neelima Kandulna (Roll No. 19EC4215) in all papers on medical reasons.

The matters are approved and the students are allowed to appear in the supplementary examination within the framework of clauses of the UG regulations.

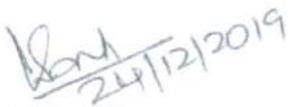
Item # 5 To consider the cancellation of admission of Aniket Mondal (Roll No. 19G80034).

The matter of withdrawal by the student is accepted. The Institute fee and Hostel fee will not be refunded except the amount that he paid in excess at the time of admission. Institute caution money and Mess fee on prorata basis will be refunded to the bank account of the individual student subject to return of original bonafide certificate and admission letter provided to them at the time of admission and submission of No Dues Certificate.

Item # 6 To consider the request of Priya Malhotra (Roll No. 19EE4203) for her continuance of M. Tech Programme 2019.

She may permitted for re-admission with scholarship on 2020-2021 with continuation of studentship up to 2021-2022 on approval of the senate.

The meeting ended with a vote of thanks to the Chair.


Dean (Academic)
Date: 24.12.2019

Tel: 011-20863698
Fax: 011-20863713
Email: jdte.ids@nic.in

ANNEXURE 5B-3-4
NBH, Aeso Dean (A&E)

HQ Integrated Defence Staff
Ministry of Defence
Trg & Policy Dte, Room No 70
Kashmir House, Rajaji Marg
New Delhi - 110 011

Recd
3/12/19
↓
Attached
is the
criteria
from
3/12/19

PGAC for
discussion
Mr. D Roy

A
2338
02.12.19

IDS/43800/2/TRADOC/T&P/PGT/Demand/20-22

18 Nov 19

To

Registrar (Academics)
National Institute of Technology Durgapur
Durgapur
West Bengal
Pin Code: 713 209

**M TECH VACANCIES FOR THE ARMED FORCES OFFICERS
UNDER POST GRADUATE TRAINING SCHEME:2020-22**

Dear Sir/ Madam,

1. The Service officers (Army, Navy and Air Force) undergo PGT courses in various disciplines under Govt of India sponsored PGT scheme. The PGT courses are subscribed in established IIST, IISc Bangalore and BARC Mumbai.
2. In our endeavor to provide wider options of institutes and also of subjects covering niche technologies, we intend to subscribe to your institution. With effect from 2020-21.
3. It is requested that PGT courses available for offer by your institute be forwarded to this HQ, along with essential educational qualification required and fees etc. It would help us in nominating suitable officers for interview by selection board.
4. Address and email-ID as given above be used for correspondence, for your kind consideration please.

(V K Singh)
Group Captain
Group Captain (Training) & Coord



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INDIA
ACADEMIC SECTION

Date: 14.01.2020

Minutes of the meeting of UGAC and PGAC held jointly on 14.01.2020 (Tuesday) at 03.00 pm in the meeting room of Academic Section.

The following members were present in the meeting

1.	Prof. I. Basak	-	Dean (Academic)
2.	Prof. A. Layek	-	HOD, ME
3.	Dr. P. Pal	-	HOD, Mathematics
4.	Prof. A. K. Mal	-	HOD, ECE
5.	Prof. T. Pal	-	HOD, CSE
6.	Prof. P. Kumbhakar	-	HOD, Physics
7.	Dr. M. M. Ghosh	-	HOD, MME
8.	Prof. C. Koley	-	HOD, EE
9.	Dr. P. S. Bhowmik	-	Asso. Dean (A & E)
10.	Prof. N. B. Hui	-	Asso. Dean (A & E)

The Chairman welcomed the members to the meeting and the agenda was placed.

Item # 1 **Confirmation of the minutes of the meeting of PGAC held on 24.12.2019 (Tuesday).**

The minutes of the PGAC meeting held on 24.12.2019 were confirmed.

Item # 2 **To consider the publication of corrigendum result of Odd Semester Regular Examination 2019-2020.**

Corrigendum results of 213 students (1st Sem - 89 students, 3rd Sem - 70 students, 5th Sem - 43 students and 7th Sem - 11 students) in UG Programme and 01 student in PG Programme are prepared on the basis of revision of marks of end term examination received from the faculty members.

The corrigendum result of Odd Semester regular examination 2019-2020 is placed and recommended for publication.

The request of Jaideep Datta (Roll No. 17EC8014) regarding attendance was not considered by the committee.

Item # 3 **To consider the request of Sriya Das (18CS8005) for revision of marks in PHS381 (Sessional).**

The matter is referred to the Senate.

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14/1/2020

- Item # 4** To consider the matter regarding the absence from the Odd Semester Regular Examination 2019 - 2020 of the following students on medical reasons.
- Akash Sharma (18ME8105) - MEC301, MEC302
 - Kirti Kumari (18ME8040) - MEC303
 - Puja Kumari (18ME8041) - MEC303
 - Ujjwal Rai (17IT8023) - MM0541, ITC501

The matters are examined and approved. The students are permitted to appear in the Odd Semester Supplementary examination 2019-2020 within the framework of clauses of the UG regulations.

- Item # 5** To consider the prayer of Uppati Ramakrishna (15/ME/102 - with 05 backlog papers) and Sanjay Lakra (15/ME/107 - with 05 backlog papers) for permission to appear in Odd and Even Semester examination of all backlog subjects.

The students may be allowed to appear in next ensuing regular / backlog examinations.

- Item # 6** To consider the application of Rahul Patel (18ME4211) regarding waiver of semester registration fee.

The matter is referred to the Dean (SW).

- Item # 7** To consider the seat matrix of UG and PG Programme for the admission year 2020-2021.

The matter is recommended and referred to the Senate for approval.

The meeting ended with a vote of thanks to the Chair.

Bank
14/1/2020
Dean (Academic)

Date: 14.01.2020

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10.01.2020

UGAe
PSB

To
Dean Academic
National Institute of Technology, Durgapur

Dated:- 10/1/2020

Subject: Request for revision of marks of Semiconductor
Devices Laboratory (PHS 381)
Semester - 3rd Branch - CS Section - A Batch-2019
-20

Respected Sir,

I, Shriya Das (18CS8005), am a 2nd year B.Tech Computer science and Engineering student. Due to a serious health issue, I had to appear for the 2nd semester Semiconductor Devices Physics, Lab final exam on an earlier date and not on my allotted date. But, after getting my grades in hand, I suspect that the viva voce marks have not been added to my marks before publishing the grades. So, with permissions from the HOD of Physics Department and the UG co-ordinator, I request you to consider my case and check once for any discrepancies that might have occurred. I will request for a change in my grades for the same

Thanking you in anticipation.

It has been checked and found that viva-voce mark has not been entered and now the revised marks is $50+25=75$. The revised marks may kindly be considered.

Yours truly

Shriya Das

18CS8005

PH No. 7059387218

H. consider it.
10/1/2020

10.01.2020

(Class Incharge)

10/01/2020

(UG Co-ordinator)

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A
24/12
14.01.2020

Date: 14.01.2020

To
The Dean (Academic and Examination)
NIT Durgapur

Sub: Request for considering short attendance in the subject Microprocessors and Microcontrollers (ECC503) due to participating in the Inter-NIT Chess tournament during 14.10.2019-21.10.2019.

(Through proper channel)

Dear Sir,

I, Jaideep Datta (Roll – 17EC8014), would like to state you that I was selected to participate in the said Inter-NIT Chess tournament and hence couldn't able to attend the regular classes during this period. As a result, my attendance in the subject, Microprocessors and Microcontrollers (ECC503) is short of 75% by 02 (two) classes only. Accordingly, though I have obtained 83, my grade is reduced by 1 and my grade is reflected as 8 instead of 9.

Therefore, I request you to kindly grant me the attendance for the missed classes and consider my grade accordingly to prevent me from the loss of my grade point. A copy of the office order for participating in the tournament is enclosed for your kind perusal.

Thanking you.

Sincerely,

Jaideep Datta

Jaideep Datta
(Roll – 17EC8014)
(Regn. No. 17U10093)

The Dean (A & E) is requested to consider the case for the sake of the student and allow to revise the attendance in the online portal.

Shankar
14/01/2020
Subject Teachers
Dr. S. K. Mandal
Dept. of ECE.

Shajinder
14/01/2020
UG Coordinator

Anil
4.1.2020
HoD, ECE

Cannot be considered as the time is long over

Barsh
14/01/2020
Dean (Academic & Examination)

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NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

INDIA
ACADEMIC SECTION

ANNEXURE 56.4.1.

Date: 24.10.2019

Minutes of the meeting of RAC (Research Academic Committee) meeting on 24.10.2019 (Thursday) at 03.30 pm at the meeting room of the Academic Section.

The following members were present in the meeting

1.	Prof. I. Basak	-	Dean (Academic)
2.	Prof. A. K. Meikap	-	Dean (R & C)
3.	Prof. S. Mukhopadhyay	-	Deptt of BT
4.	Prof. S. Choudhury	-	HOD, BT
5.	Prof. P. Kumbhakar	-	HOD, Physics
6.	Prof. S. Choudhuri	-	HOD, BT
7.	Dr. D. Chakraborty	-	For, HOD, HSS
8.	Dr. D. Pal	-	For HOD, MS
9.	Prof. C. Koley	-	HOD, EE
10.	Prof. A. K. Samanta	-	HOD, CE
11.	Prof. A. Layek	-	HOD, ME
12.	Prof. T. Pal	-	HOD, CSE
13.	Prof. G. Halder	-	HOD, ChE
14.	Prof. K. Adhikari	-	HOD, HSS
15.	Dr. P. Pal	-	HOD, Mathematics
16.	Prof. R. N. Saha	-	HOD, Chemistry
17.	Prof. N. B. Hui	-	Asso. Dean (A & E)
18.	Dr. P. S. Bhowmik	-	Asso. Dean (A & E)
19.	Dr. S. Roy Barman	-	Asso. Dean (A & E)

The Chairman welcomed the members to the meeting and the agenda was placed.

Item # 1 Confirmation of the minutes of the meeting of RAC held on 29.08.2019 (Thursday) at 03.30 pm.

The minutes of the RAC meeting held on 29.08.2019 were confirmed.

Item # 2 To consider registration for Ph.D. Programme

SL. NO	NAME	DEPT	SUPERVISOR	DATE OF REGISTRATION
1	SAIKAT ROY	MA	DR. S. BAGCHI	09.09.2019
2	LEKHA SHARMA	MA	DR. P. PAL	20.09.2019
3	BIPLAB BEHERA	CE	DR. R. P. NANDA	23.09.2019
4	SUMONA SHOW	CH	DR. G. HALDER	27.09.2019

The registrations are recommended and to be reported to Senate for approval.

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24/10/19

Item # 3 To consider the name of the students to be awarded with Ph.D. Degree - completed all requirements for the award of Ph.D. Degree.

SL. NO.	REGN. NO	DEPT	SCHOLARS	NAME OF THE SUPERVISOR(S)	DATE OF AWARD
1	NITD/PhD/ECE/2014/00491	ECE	SAMARENDRA NATH SUR	1) DR. B MAJI 2) DR. R. N. BERA	19.09.2019
2	NITD/PhD/CHE/2015/00625	CHE	ASHOK PRABHAKAR	1) PROF. A. K. SADHUKHAN 2) PROF. P. P. GUPTA	19.09.2019
3	NITD/PhD/MA/2016/00736	MA	ANKUSH CHANDA	1) DR. L. K. DEY	21.10.2019

The award of PhD Degrees are recommended and to be reported to Senate for approval.

Item # 4 To consider the appeal regarding extension of registration period of

- Arghya Guchhait (Reg. No. NITD/PhD/ECE/2013/00406) - by one year (Pre - submission seminar was held in July 2018.)
- Avijit Pramanik (Reg. No. NITD/PhD/HSS/2014/00538) - by one year.
- Kumar Ashish (Reg. No. NITD/PhD/ME/2014/00510) - by one year.
- Bobde Kiran Ashok (Reg. No. NITD/PhD/BT/2014/00521) - by one year.
- Swapnadip Roy (Reg. No. NITD/PhD/CH/2014/00523) - by one year.
- Saswati Roy (Reg. No. NITD/PhD/MS/2014/00563) - by one year.
- Nasir Hasan Sk (Reg. No. NITD/PhD/ME/2014/00537) - by one year.
- Narayanan Venkateswaran (Reg. No. NITD/PhD/CA/2014/00558) - by one year.
- Hrishikesh Mondal (Reg. No. NITD/PhD/PH/2015/00595) - by one year.

The extension of PhD registration period for

- Avijit Pramanik (Reg. No. NITD/PhD/HSS/2014/00538) - by one year up to 23.09.2020.
- Kumar Ashish (Reg. No. NITD/PhD/ME/2014/00510) - by one year up to 01.08.2020.
- Bobde Kiran Ashok (Reg. No. NITD/PhD/BT/2014/00521) - by one year up to 12.09.2020.
- Swapnadip Roy (Reg. No. NITD/PhD/CH/2014/00523) - by one year up to 12.09.2020.
- Saswati Roy (Reg. No. NITD/PhD/MS/2014/00563) - by one year up to 31.10.2020.
- Nasir Hasan Sk (Reg. No. NITD/PhD/ME/2014/00537) - by one year up to 22.09.2020.
- Narayanan Venkateswaran (Reg. No. NITD/PhD/CA/2014/00558) - by one year up to 22.10.2020.
- Hrishikesh Mondal (Reg. No. NITD/PhD/PH/2015/00595) - by one year up to 16.02.2021.
- Arghya Guchhait (Reg. No. NITD/PhD/ECE/2013/00406) - the matter is kept pending till justification for such delay from the scholar through his guide is approved by RAC.

Item # 5 To consider formation of revised DSC for

- Narayanan Venkateswar (Roll No. 13/CA/1505)
- Subhrajyoti Kundu (Roll No. 17EE1102)

The matters of formation of revised DSC for Narayanan Venkateswar (Roll No. 13/CA/1505) and Subhrajyoti Kundu (Roll No. 17EE1102) are approved.

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24/10/19

Item # 6 To consider the matter of conversion of status of fellowship

- Oliva Roy (Reg. No. NITD/PhD/HS/2016/00724) – As she wishes to join Mewar University, Rajasthan
- Kabita Mondal (Reg. No. NITD/PhD/HS/2018/01067) – As she wishes to join Sarojini Naidu College for Women, Dum Dum, Kolkata
- Soumen Kundu (Reg. No. NITD/PhD/MA/2016/00784) – INSPIRE Research Scholar - As he wishes to join ICFAL, Tripura
- Monalisa Sardar (Roll No. 17CS1107, Regn. No. 19 RCS 044) – As she wishes to join Mankar College.

The matters are recommended for approval subject to submission of no objection certificate from the prospective employer with regard to continuation of their research work on part time mode. The fellowships will be stopped from their respective date of joining to job.

Item # 7 To consider the matter of absence of Jasper D (Roll No. 16EE1101) from 15.06.2019 to 30.07.2019 due to medical reasons (to be read in conjunction with item no. 8 of previous RAC meeting as "To consider the matter of absence of Jasper D (Roll No. 16EE1101) from 14.06.2019 to 31.08.2019 due to medical reasons").

The student can avail the leave for the period entitled to him and the period over and above the entitlement will be treated as a period without scholarship.

Item # 8 To consider the request for relaxation in semester registration fee in respect of re-Submission of PhD Thesis of Ajeet Singh Chhabra (Reg. No. NITD/Ph.D/CE/2014/00509).

The request cannot be accepted as per the Institute regulation and the fees for continuation of studentship has to be paid.

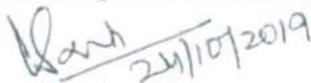
Item # 9 To consider the appeal of Doel Pal (Roll No. 18BT1106) for issuing NOC from NITD for transfer of JRF fellowship and taking Admission in new Institute.

The admission of Doel Pal (Roll No. 18BT1106) is permitted to withdraw and the supervisor may issue the NOC.

Item # 10 To consider the appeal of Sukhamoy Dhabal (Reg. No. NITD/PhD/BT/2016/00759) to extend the date of submission of thesis by six months (Pre – submission seminar was held on 16/5/2019).

The matter is recommended for approval and he has to reappear for pre-submission seminar in accordance with the PhD regulation.

The meeting ended with a vote of thanks to the Chair.


Dean (Academic)
Date: 24.10.2019

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NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

ACADEMIC SECTION

ANNEXURE 56.4.2

Date: 28.11.2019

Minutes of the meeting of RAC (Research Academic Committee) meeting on 21.11.2019 (Thursday) at 03.30 pm at the meeting room of the Academic Section.

The following members were present in the meeting

1.	Prof. I. Basak	-	Dean (Academic)
2.	Prof. P. Kumbhakar	-	HOD, Physics
3.	Prof. S. Choudhuri	-	HOD, BT
4.	Dr. D. Chakraborty	-	For, HOD, HSS
5.	Dr. D. Pal	-	For HOD, MS
6.	Prof. C. Koley	-	HOD, EE
7.	Prof. A. K. Samanta	-	HOD, CE
8.	Prof. T. Pal	-	HOD, CSE
9.	Prof. A. K. Mal	-	HOD, ECE
10.	Prof. R. N. Saha	-	HOD, Chemistry
11.	Prof. N. B. Hui	-	Asso. Dean (A & E)
12.	Dr. P. S. Bhowmik	-	Asso. Dean (A & E)
13.	Dr. S. Roy Barman	-	Asso. Dean (A & E)

The Chairman welcomed the members to the meeting and the agenda was placed.

Item # 1 Confirmation of the minutes of the meeting of RAC held on 24.10.2019 (Thursday) at 03.30 pm.

The minutes of the RAC meeting held on 24.10.2019 were confirmed.

Item # 2 To consider the name of the students to be awarded with Ph.D. Degree - completed all requirements for the award of Ph.D. Degree.

SL. NO.	REGN. NO	DEPT	SCHOLAR	NAME OF THE SUPERVISOR	DATE OF AWARD
1.	NITD/PhD/CY/2016/00776	CY	BISWAJIT CHOWDHURY	1) Dr. MILAN MAJI AND 2) Dr. BHASKAR BISWAS, R. R., DARJEELING	30-10-19
2.	NITD/PhD/MA/2016/00758	MA	PRATIKSHAN MONDAL	1) Dr. L. K. DEY 2) Dr. SK JAKER ALI, BOLPUR COLLEGE, W. B.	04-11-19
3.	NITD/PhD/CH/2013/00389	CH	SOMA SARKAR	1) Dr. S. S. PANJA 2) Dr. R. N. SAHA	08-11-19
4.	NITD/PhD/ECE/2014/00503	EC	ANKITA MITRA	1) Dr. A. K. BHATTACHERJEE 2) Dr. ARUNAVA DE, K. L. E. F. HYDERABAD TELENGANA	08-11-19
5.	NITD/PhD/ME/2012/00359	ME	KATHIRVEL S.	1) Dr. APURBA LAYEK 2) Dr. MUTHURAMAN S., SULTANATE OF OMAN	08-11-19
6.	NITD/PhD/MA/2016/00821	MA	DEBNARAYAN KHATUA	1) Dr. SAMARJIT KAR 2) Dr. KALIPADA MAITY, M. G. M., MUGBERIA, INDIA	13-11-19
7.	NITD/PhD/CSE/2015/00651	CS	JOGENDRE GARAIN	1) Dr. G. SANYAL 2) Dr. D. R. KISKU	13-11-19

The award of PhD Degrees are recommended and to be reported to Senate for approval.

[Handwritten Signature]
28/11/19

- Item # 4 To consider the appeal regarding extension of period for registration of
- Mousumi Biswas (Roll No. 17BT1103) - by one year.

PhD registration period for Mousumi Biswas (Roll No. 17BT1103) is extended by one year, up to June 2020 considering the medical ground.

- Item # 5 To consider formation of revised DSC for
- Jyotirmoy Samanta (Reg. No. NITD/PhD/MS/2013/00396)
 - Sujata Bose (Reg. No. NITD/PhD/MS/2013/00454)
 - Asmita Basu (Reg. No. NITD/PhD/MS/2013/00869)
 - Argha Deep Paul (Roll No. 17EC1103)
 - Krishendu Kumar Pobi (Reg. No. NITD/PhD/CH/2014/00525)

The formation of revised DSC for the above mentioned scholars became necessary due to superannuation of one or more members. The proposed new members are found correct to the regulation and all the above cases are approved.

- Item # 6 To consider the matter of conversion of status of studentship of
- Monalisa Sardar (Reg. No. 19RCS044) - appointed in Mankar College
 - Sourav Paul (Reg. No. NITD/PhD/HS/2018/01016) - appointed in Kaliachak College.

The matters are recommended for approval subject to submission of No Objection Certificate from the current employer with regard to continuation of their research work on part time mode. The fellowships will be stopped from their respective date of joining to jobs.

- Item # 7 To consider the matter of change of affiliation of the supervisor of
- Shilpi Chatterjee (Roll No. 16/CH/1101 - FT)
 - Prantik Mondal (15/CH/1106 - PT)

The matters are noted and recorded.

- Item # 8 To consider the matter regarding delay in submission of forms (Form No. III and IV) by Sumona Roy (Roll No: 19CH 1501).

The matter is approved and to be reported to the senate to ratify the Senate nominee..

- Item # 9 To consider the change of name from "Meenakshi" (Reg. No. NITD/PhD/CH/2018/01055) to "Meenakshi Malhotra".

The scholar requested to change the name from "Meenakshi" (Reg. No. NITD/PhD/CH/2018/01055) to "Meenakshi Malhotra" as per her marriage certificate and appealed to incorporate it in academic documents. It is resolved that all the ensuing documents will be issued accordingly.

- Item # 10 To consider inclusion of external supervisor for Madhab Dhali (Roll No. 17EC1101)

The documents of the proposed external supervisor, Dr. Gopi Ram, NIT Warangal, were found in order and the inclusion is approved.

- Item # 11 To consider the issues raised by
- Kshitiza Vasudeva (Roll No. 19CS1502) and
 - Najima Begum (Roll No. 19EC1503) - Part Time PhD scholars under the Category J (TEQIP).

Clause 2.3.3 of the PhD Regulations states- The part-time candidates of categories H, I and J are mandated to have contact with the supervisor(s) for discussion and research in the Institute for at least 90 days a year in a single/multiple visits.

Clause 6.2.1. of the PhD Regulations states- All Ph.D. scholars are required to qualify the course "Research Methodology".

Clause 6.2.2. of the PhD Regulations state "The DSC will prescribe additional courses as follows:

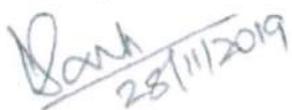
- i) Scholars with M. Tech./ equivalent degree obtained within last 5 years- Minimum 8 credits.
- ii) Scholars with B. Tech./ MSc/ MA/ MCA degree or M. Tech. degree obtain more than 5 years ago- Minimum 16 credits.
- iii) While this is a general guideline, the DSC may decide on higher credits requirement.
- iv) Online courses offered by MOOCS/ NPTEL etc. and conduct online examination may also be utilised for the purpose of credit requirement, as assigned by the DSC."

In view of above, the scholars are advised to adhere to the clauses of the Phd Regulations of the Institute

- Item # 12 To consider the matter of advertisement of Walk in Admission Test and Viva Voce for admission to Full Time PhD programme (Institute Fellowship- vacant seats of July 2019 admission, Externally Sponsored Projects CSIR/UGC, DST - Inspire Fellowship) in Even Semester 2019-2020.

The available seat matrix was placed on the table along with the proposed dates of salient events. The matter is approved and the advertisement is cleared for the posting on the Institute website.

The meeting ended with a vote of thanks to the Chair.



Dean (Academic)

Date: 28.11.2019

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NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR

ACADEMIC SECTION

ANNEXURE 50.4.3

Date: 24.12.2019

Minutes of the meeting of RAC (Research Academic Committee) meeting on 24.12.2019 (Tuesday) at 11.30 am at the meeting room of the Academic Section

The following members were present in the meeting

1.	Prof. I. Basak	-	Dean (Academic)
2.	Prof. S. Choudhuri	-	HOD, BT
3.	Prof. G. Halder	-	HOD, CHE
4.	Dr. S. N. Mahato	-	For HOD, EE
5.	Prof. A. Layek	-	HOD, ME
6.	Dr. N. Banerjee	-	HOD, MS
7.	Dr. S. Bagchi	-	For HOD, Mathematics
8.	Prof. K. Adhikari	-	HOD, EES
9.	Prof. A. K. Mal	-	HOD, ECE
10.	Prof. S. Bhattacharjee	-	For HOD, CE
11.	Dr. S. Ghosal	-	For HOD, Chemistry
12.	Prof. P. Kumbhakar	-	HOD, Physics
13.	Dr. P. S. Bhowmik	-	Asso. Dean (A & E)
14.	Prof. N. B. Hui	-	Asso. Dean (A & E)
15.	Dr. S. Roy Barman	-	Asso. Dean (A & E)

The Chairman welcomed the members to the meeting and the agenda was placed.

Item # 1 Confirmation of the minutes of the meeting of RAC held on 21.11.2019 (Thursday) at 03.30 pm.

The minutes of the RAC meeting held on 21.11.2019 were confirmed.

Item # 2 To consider the publication of result of examination for course work during Odd Semester 2019-2020.

The result of examination for course work during Odd Semester 2019-2020 is placed and is recommended for publication.

Item # 3 To consider registration for Ph.D. Programme

SL. NO	NAME	DEPT	SUPERVISOR	DATE OF REGISTRATION
1	RIJU KARMAKAR	PH	PROF. A. K. MEIKAP	28.11.2019
2	PULLABHATLA SRIKANTH	EE	DR. C. KOLEY	13.12.2019
3	IPSITA SOM	CY	DR. R. N. SAHA	16.12.2019
4	SWARUP KUMAR TARAI	CY	DR. S. C. MOI	16.12.2019
5	RITUPARNA BHADURI	CY	DR. S. C. MOI	17.12.2019
6	ANGANA PAN	CY	DR. S. C. MOI	17.12.2019
7	SHUBHRAJYOTI KUNDU	EE	PROF. S. S. THAKUR; DR. B. K. SAHA ROY	18.12.2019
8	SANDEEP KUMAR DAS	EE	DR. S. SARKAR	19.12.2019

The registrations are recommended and to be reported to Senate for approval.

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24/12/2019

Item # 4 . To consider the name of the students to be awarded with Ph.D. Degree - completed all requirements for the award of Ph.D. Degree.

SL. NO.	REGN. NO	DEPT	SCHOLAR	NAME OF THE SUPERVISOR	DATE OF AWARD
1	NITD/PhD/MS/2015/00658	MS	NAYANIYOTI BHATTACHARJEE	Dr. ANUPAM DE	29-11-19
2	NITD/PhD/PH/2015/00584	EE	DIHRAJ KUMAR RANA	Dr. SOUMEN BASU	02-12-19
3	NITD/PhD/CH/2014/00525	CY	KRISHNENDU KUMAR POBI	Dr. RAJNARAYAN SAHA	05-12-19
4	NITD/PhD/CH/2016/00768	CH	GANTA UPENDAR	Dr. SUSMITA DUTTA Dr. K. C. GHANTA	06-12-19
5	NITD/PhD/PH/2015/00600	PH	SHOVAN KUMAR KUNDU	Dr. SOUMEN BASU	06-12-19
6	NITD/PhD/MA/2016/00785	MA	ANIRUDDHA SAMANTA	Dr. KAJLA BASU	06-12-19
7	NITD/PhD/CHE/2014/00534	CH	KALYAN KUMAR SARKAR	Dr. TAMAL MANDAL	10-12-19
8	NITD/PhD/MA/2016/00706	MA	ANUPAM DE	Dr. GOUTAM PANIGRAHI ; Dr. KALIPADA MAITY (MUGBERIA GANGADHAR MAHAVIDALAYA, EAST MIDNAPORE); Dr. MANORANJAN MAITY (FORMER PROF. DEPARTMENT OF APPLIED MATHEMATICS, VIDYASAGAR UNIVERSITY, MEDINIPUR)	13-12-19
9	NITD/PhD/CC/2015/00620	CS	THAPSEELA KOYA POOLAKKACHALIL	Dr. SARAVANAN CHANDRAN	16-12-19
10	NITD/PhD/ChE/2014/00464	CH	SHYAMAL BHUNIA	Dr. ANUP KUMAR SADHUKHAN Dr. PARTHAPRATIM GUPTA Dr. SUBHAMAY HALDER (Retired Prof.)	20-12-19
11	NITD/PhD/PH/2014/00511	PH	MANISH KUMAR	Dr. S. SAHOO	23-12-19
12	NITD/PhD/PH/2014/00505	PH	NILANJAN CHAKRABARTY	Dr. A. K. CHAKRABORTY	23-12-19

The award of PhD Degrees are recommended and to be reported to Senate for approval.

- Item # 5 To consider the appeal regarding extension of period for registration of**
- Sujata Bose (Reg. No. NITD/PhD/MS/2013/00454) - by one year.
 - Samik Samanta (Reg. No. NITD/PhD/ECE/2015/00581) - by one year.
 - Sujay Chattaraj (Reg. No. NITD/PhD/CHE/2014/00579) - by one year.

The extension of PhD registration period granted for
Sujata Bose (Reg. No. NITD/PhD/MS/2013/00454) - by one year up to 20.12.2020.
Samik Samanta (Reg. No. NITD/PhD/ECE/2015/00581) - by one year up to 03.02.2021.
Sujay Chattaraj (Reg. No. NITD/PhD/CHE/2014/00579) - by one year up to 15.12.2020.

- Item # 6 To consider formation of DSC and revised DSC for**
- Sourav Das (Roll No. 18/EE/1103)
 - Sujay Chattaraj (Roll No. 13/CHE/1510)
 - Veena Panjwani (Roll No. 16/HS/1501)
 - Palas Kar (Roll No. 15/MME/1103)
 - Sukhamoy Dhabal (15/BT/1103)

The matter of formation of DSC for Sujay Chattaraj (Roll No. 13/CHE/1510) and Veena Panjwani (Roll No. 16/HS/1501) are approved.

The matter of formation of revised DSC for Sourav Das (Roll No. 18/EE/1103), Palas Kar (Roll No. 15/MME/1103), and Sukhamoy Dhabal (15/BT/1103) are also approved.

- Item # 7 To consider the application of Depannita Deb (Roll no. 16MS1304), Part Time Scholar to work in RITM Paris for one year.**

The matters is not permitted in the given condition.

Item # 8 To consider the application of Debasish Das Sharma (Roll No. 18CH1503) for late submission of PhD Examination Form.

The submission of form is permitted by payment with fine of Rs. 2000/-.

Item # 9 To consider for request for Extension of PhD Thesis Submission Date (Post Pre-Submission Seminar Case) of Madhabendra Sinha (Roll No: 15/HS/1105).

The research scholar has to deliver pre-submission seminar again on complete preparation of thesis.

Item # 10 To consider the change of status of studentship from Full Time to Part Time and Part Time Sponsored to Part Time Self-Sponsored after completion of registration process.

The matter will be dealt on case to case basis.

The meeting ended with a vote of thanks to the Chair.

[Handwritten Signature]
24/12/2019

Dean (Academic)

Date: 24.12.2019

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ANNEXURE 56.4.3.1.

Date: 21/11/2019

To,
The TEQIP Coordinator,
NIT Durgapur

Subject: Regarding course Work (Research methodology)

Dear Sir,

I am Najima Begum, enrolled as a Ph.D. part time candidate under the J (TEQIP) category (19CS1503) in the Computer Engineering department in the July 2019 session. Currently, I'm working in BIT Mesra as Assistant Professor (TEQIP faculty) in Computer Science and Engineering Department.

Since we have started pursuing the course work from this semester, we have been facing a few issues. There are some contradictions between the guidelines we have received from NPIU and the guidelines available at the NIT Durgapur website.

Recently we received a notification from NIT Durgapur regarding registration of Research methodology subject, for which we are asked to attend classes in the college twice a week. But according to NPIU guidelines we are asked to complete our total course work through MOOCs so that it does not hamper the work in the host institute. And according to NIT Durgapur Ph.D. regulation 6.2.2(iv), we can complete our coursework using MOOC/NPTEL, and Research methodology subject is available online in NPTEL. So, kindly allow me to register the course in NPTEL and use its credit.

I have few colleagues working under the same project as mine (TEQIP) who are pursuing their Ph.D. from NIT Surathkal and NIT Jamshedpur. Their course work has been done through MOOCs/ Self-study.

Taking into consideration the distance and the non-availability of the leaves in the host institute, I would not be able to attend regular lectures in NIT Durgapur.

I sincerely request you to consider this matter and help me resolve the issues so that I can complete the course work. I'll be obliged if you can look into the matter and do the needful.

Thanking you,

Yours Sincerely,

Najima Begum
Roll No. 19CS1503
Department of CSE

*Najima Begum
21/11/19*

forwarded

*Subhrabrata Choudhury
21/11/2019*

Subhrabrata Choudhury
Professor, Dept. of Computer Science & Engineering
National Institute of Technology Durgapur, India

forwarded for kind consideration.

Dean (Academic)

*Sanku
21/11/19
(No. 10/19)*

Minutes discussed in PAC/21-11-2019

11/06/2019

To

The Head, IQIP Cell
NIT Durgapur

Sub: Seeking permission for doing course work online or self study. Reg.

Dear Sir,

I am Kshitiza Vasudeva, enrolled as a Ph.D. part-time candidate under the J (TEQIP) category (19CS1502) in the Department of Computer Science and Engineering in the July 2019 session. Currently, I'm working in the BIT Mesra as an Assistant Professor (TEQIP faculty) in the Department of Computer Science and Engineering.

I have been facing a few Ph.D. regulation mismatch between NPIU and NIT Durgapur. Thus, I am unable to register for the course work.

Recently I received a communication from the NIT Durgapur regarding registration of the Research methodology course, for which we have to attend the classes regularly in the NIT Durgapur (Friday and Monday). But according to NPIU guidelines I can complete the course work through MOOCs so that it does not hamper the academic work at the BIT Mesra.

According to the NIT Durgapur Ph.D. regulation 6.2.2 (iv), we can complete our coursework using MOOC/NPTEL. Further, the Research methodology course is available online in NPTEL.

Few BIT Mesra colleagues pursuing Ph.D. under the TEQIP project at NIT Surathkal and NIT Jamshedpur and they were allowed to complete the course work through MOOCs/Self-study.

The BIT Mesra is not granting leaves for attending course work on the basis of NPIU guidelines. Thus, I am unable to attend regular classes in the NIT Durgapur.

I sincerely request you to kindly consider my application and help me to complete the course work online or self-study.

Thanking you!

Yours Sincerely,

Kshitiza Vasudeva
Roll No. 19CS1502
Department of CSE, NIT Durgapur

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[Handwritten notes: Discussed with Ae/01.11.2019]

ANNEXURE 56.8.1.1

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
DEPARTMENT OF BIOTECHNOLOGY

ANNEXURE 56.8.1.1.

To
The Dean Academic
NIT Durgapur

23 October 2019

Sub: Proposal for opening M.Sc. Life Science Program

Biotechnology department is proposing to start a two year full time self-sponsored M.Sc program in Life Science from the academic year 2020-21. The department duly convened a series of DPAC meetings including a special one with external experts (Prof. A K Das, Head, School of Life Science, IIT Kharagpur and Prof T Sengupta, Department of Biological Science, IISER Kolkata) to finalise the curriculum and syllabus. The resolutions are attached herewith.

The proposal may be ratified in PGAC and senate.

 23/10/19

Head
Biotechnology Department

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
DEPARTMENT OF BIOTECHNOLOGY

Date: October 18, 2019

NOTICE

A Departmental Academic Committee (DAC)/Departmental Postgraduate Academic Committee (DPAC) meeting will be held on October 21, 2019 (Monday) at 12.15 pm in the office of the Head of the Department. All faculty members are requested to kindly attend the said meeting.

Agenda:

1. Incorporation of changes suggested by external experts for the proposed M.Sc Life Science curriculum and syllabus.
2. Departmental purchase committee modification.
3. Distribution of the second installment of funds received under OH-31.
4. List of equipment to be purchased under funds received (OH-35).
5. Any other matter.



Oindrilla Mukherjee
Member Secretary, DAC & DPAC

To:

1. Prof. Surabhi Chaudhuri
2. Prof. Apurba Dey,
3. Prof. Sudip Chattopadhyay
4. Prof. Sudit S. Mukhopadhyay
5. Prof. Kaustav Aikat
6. Prof. Dalia Dasgupta Mandal
7. Dr. Debjani Dutta
8. Dr. KazySutia Khannam
9. Dr. Monidipa Ghosh
10. Dr. Subhankar Roy Barman
11. Dr. Ashish Bhattacharjee
12. Dr. Nibedita Mahata
13. Dr. Sougata Saha
14. Dr. Debojyoti De
15. Dr. Sudipta Mandal
16. Dr. Anita Barik

Head, Chairperson *HK*
Member *✓*
Member *SB*
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NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
DEPARTMENT OF BIOTECHNOLOGY

Date: October 21, 2019

Minutes of the Departmental Academic Committee (DAC)/Departmental Postgraduate Academic Committee (DPAC) meeting held on October 21, 2019 at 12.15p.m in the office of the Head of the Department.

The following members were present in the meeting:

- | | | |
|--------------------------------|------------------|---|
| 1. Prof. Surabhi Chaudhuri | Chairperson |  |
| 2. Prof. Apurba Dey. | Member |  |
| 3. Prof. Sudit S. Mukhopadhyay | Member |  |
| 4. Prof. Kaustav Aikat | Member |  |
| 5. Prof. Dalia Dasgupta Mandal | Member |  |
| 6. Dr. Debjani Dutta | Member |  |
| 7. Dr. Subhankar Roy Barman | Member |  |
| 8. Dr. Ashish Bhattacharjee | Member |  |
| 9. Dr. Nibedita Mahata | Member |  |
| 10. Dr. Sougata Saha | Member |  |
| 11. Dr. Debojyoti De | Member |  |
| 12. Dr. Sudipta Mandal | Member |  |
| 13. Dr. Amita Barik | Member |  |
| 14. Dr. Oindrilla Mukherjee | Member Secretary |  |

The resolutions of the meeting are as follows:

1. The changes as suggested by the external experts on their visit on September 25, 2019 with has been incorporated in the proposed M.Sc Life Sciences curriculum. The same is attached as Annexure I. Furthermore, based on the curriculum of the institute, some more modifications was brought about in the curriculum with respect to credits and names of various courses. The tentative syllabus and curriculum are attached as Annexure II.
2. Dr. Debojyoti De has been added to the list of members of the Departmental Purchase committee.
3. The amount received in the second installment under the recurring head (OH-31) is 6 lakhs. The amount is to be equally divided among all laboratories in the upcoming semester (7) and among the 17 faculty members, resulting in a share of INR 25,000 each.
4. It was resolved that 75 laboratory stools is needed to be purchased and the Head will seek an approval to utilize some of the amount of the non-recurring amount (under OH-35) sanctioned in this installment for this purpose.

The following items needs to be purchased as per available amount and priority as listed below:

- i. Lyophilizer
- ii. Temperature controlled shaking incubator
- iii. Sonicator
- iv. Shaking water bath
- v. COD digester
- vi. Chemidoc Imaging System
- vii. Fine weighing balance (precision upto 3 digits post decimal)

No note of dissent was recorded in the meeting.
The meeting ended with thanks to the chair

Shhh. 22/10/19

Prof. Surabhi Chaudhuri
Chairperson, Department of Biotechnology

Handwritten signatures and initials scattered at the bottom of the page, including a large signature on the left, several initials in the center, and a signature on the right with the number 53 below it.

Suggestions from the experts on syllabus of M.Sc. (Life Science) program at NIT Durgapur and action taken:

Sl No.	Suggestion	Response/Action taken
1.	The tutorial hours may be included in the lecture hours.	The suggested changes have been made in LS 1003-Methods in Biology and LS 2003-Biophysics & Structural Biology. However, due to discussion oriented content for the courses, LS 3002-Scientific Communications and LS 4002-Project Writing & Presentation, tutorial hours have been retained.
2.	The syllabus of "Microbiology & Molecular Biology" may be taught according to the student batch considering the heterogeneous population.	This suggestion will be followed while teaching the course.
3.	The syllabus of "Immunology & Cancer Biology" may be taught according to the student batch considering the heterogeneous population.	This suggestion will be followed while teaching the course.
4.	Laboratory names may be mentioned in the curriculum.	These/They are mentioned in the curriculum.
5.	A few reference books have been suggested to be included for "Biophysics & Structural Biology" and "Enzymology & Bioenergetics".	Books have been added to the list of suggested reading material for LS 2003-Biophysics & Structural Biology and LS 2005-Enzymology & Bioenergetics.
6.	The courses like "Scientific Communications" & "Project Writing & Presentation" may be defined considering aspects of 'research ethics & IPR'.	Topics on ethics have now been incorporated in the syllabus.
7.	Eligibility degree criteria may be broadened as B.Sc. in any branches of Life Sciences and Physics & Chemistry.	Eligibility criteria now reads as: B. Sc. in any branch of Life Sciences/Chemistry/ Physics.
8.	The admission policy: it was informed that IIT Kharagpur and IACS, Kolkata jointly conduct an independent examination for their M.Sc. admission. It was suggested whether NIT Durgapur can conduct such an examination for admission to M.Sc. (Life Sciences) either jointly or independently. If not possible, students may be taken through JAM / JEST by fixing up a rank cut-off by the competent authority and a B.Sc. cut off marks of > 60% (Prefinal year / semester, 60% for provisional admission). If the marks obtained is in CGPA, then minimum of 6.5 CGPA should be obtained on a 10-point scale. In case, JAM / JEST scores are not available, a B.Sc. cut off marks of > 70% may be fixed for admission.	This suggestion will be further discussed with the competent authority for further action.

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NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
DEPARTMENT OF BIOTECHNOLOGY

Date: October 18, 2019

NOTICE

A Departmental Academic Committee (DAC)/Departmental Postgraduate Academic Committee (DPAC) meeting will be held on October 21, 2019 (Monday) at 12.15 pm in the office of the Head of the Department. All faculty members are requested to kindly attend the said meeting.

Agenda:

1. Incorporation of changes suggested by external experts for the proposed M.Sc Life Science curriculum and syllabus.
2. Departmental purchase committee modification.
3. Distribution of the second installment of funds received under OH-31.
4. List of equipment to be purchased under funds received (OH-35).
5. Any other matter.


2.10.19

Oindrilla Mukherjee
Member Secretary, DAC & DPAC

To:

1. Prof. Surabhi Chaudhuri
2. Prof. Apurba Dey,
3. Prof. Sudip Chattopadhyay
4. Prof. Sudit S. Mukhopadhyay
5. Prof. Kaustav Aikat
6. Prof. Dalia Dasgupta Mandal
7. Dr. Debjani Dutta
8. Dr. KazySufia Khannam
9. Dr. Monidipa Ghosh
10. Dr. Subhankar RoyBarman
11. Dr. Ashish Bhattacharjee
12. Dr. Nibedita Mahata
13. Dr. Sougata Saha
14. Dr. Debojyoti De
15. Dr. Sudipta Mandal
16. Dr. Amita Barik

Head, Chairperson 
Member 
Member 
Member 
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NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
DEPARTMENT OF BIOTECHNOLOGY

Date: October 21, 2019

Minutes of the Departmental Academic Committee (DAC)/Departmental Postgraduate Academic Committee (DPAC) meeting held on October 21, 2019 at 12.15p.m in the office of the Head of the Department.

The following members were present in the meeting:

1. Prof. Surabhi Chaudhuri
2. Prof. Apurba Dey.
3. Prof. Sudit S. Mukhopadhyay
4. Prof. Kaustav Aikat
5. Prof. Dalia Dasgupta Mandal
6. Dr. Debjani Dutta
7. Dr. Subhankar Roy Barman
8. Dr. Ashish Bhattacharjee
9. Dr. Nibedita Mahata
10. Dr. Sougata Saha
11. Dr. Debojyoti De
12. Dr. Sudipta Mandal
13. Dr. Amita Barik
14. Dr. Oindrilla Mukherjee

Chairperson 
Member 
Member 
Member 
Member 
Member 
Member 
Member 
Member 
Member 
Member 
Member 
Member 
Member Secretary 

The resolutions of the meeting are as follows:

1. The changes as suggested by the external experts on their visit on September 25, 2019 with has been incorporated in the proposed M.Sc Life Sciences curriculum. The same is attached as Annexure I. Furthermore, based on the curriculum of the institute, some more modifications was brought about in the curriculum with respect to credits and names of various courses. The tentative syllabus and curriculum are attached as Annexure II.
2. Dr. Debojyoti De has been added to the list of members of the Departmental Purchase committee.
3. The amount received in the second installment under the recurring head (OH-31) is 6 lakhs. The amount is to be equally divided among all laboratories in the upcoming semester (7) and among the 17 faculty members, resulting in a share of INR 25,000 each.
4. It was resolved that 75 laboratory stools is needed to be purchased and the Head will seek an approval to utilize some of the amount of the non-recurring amount (under OH-35) sanctioned in this installment for this purpose.

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- iii. Sonicator
- iv. Shaking water bath
- v. COD digester
- vi. Chemidoc Imaging System
- vii. Fine weighing balance (precision upto 3 digits post decimal)

No note of dissent was recorded in the meeting.
The meeting ended with thanks to the chair

Shilpa 22/10/19

Prof. Surabhi Chaudhuri
Chairperson, Department of Biotechnology

Handwritten signatures and initials:
A cluster of approximately seven handwritten signatures and initials, including a large signature on the left, a signature with '22/10/19' written below it, and several other initials and names.

Suggestions from the experts on syllabus of M.Sc. (Life Science) program at NIT Durgapur and action taken:

Sl No.	Suggestion	Response/Action taken
1.	The tutorial hours may be included in the lecture hours.	The suggested changes have been made in LS 1003-Methods in Biology and LS 2003-Biophysics & Structural Biology. However, due to discussion oriented content for the courses, LS 3002-Scientific Communications and LS 4002-Project Writing & Presentation, tutorial hours have been retained.
2.	The syllabus of "Microbiology & Molecular Biology" may be taught according to the student batch considering the heterogeneous population.	This suggestion will be followed while teaching the course.
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4.	Laboratory names may be mentioned in the curriculum.	These/They are mentioned in the curriculum.
5.	A few reference books have been suggested to be included for "Biophysics & Structural Biology" and "Enzymology & Bioenergetics".	Books have been added to the list of suggested reading material for LS 2003-Biophysics & Structural Biology and LS 2005-Enzymology & Bioenergetics.
6.	The courses like "Scientific Communications" & "Project Writing & Presentation" may be defined considering aspects of 'research ethics & IPR'.	Topics on ethics have now been incorporated in the syllabus.
7.	Eligibility degree criteria may be broadened as B.Sc. in any branches of Life Sciences and Physics & Chemistry.	Eligibility criteria now reads as: B. Sc. in any branch of Life Sciences/Chemistry/ Physics.
8.	The admission policy: it was informed that IIT Kharagpur and IACS, Kolkata jointly conduct an independent examination for their M.Sc. admission. It was suggested whether NIT Durgapur can conduct such an examination for admission to M.Sc. (Life Sciences) either jointly or independently. If not possible, students may be taken through JAM / JEST by fixing up a rank cut-off by the competent authority and a B.Sc. cut off marks of > 60% (Prefinal year / semester, 60% for provisional admission). If the marks obtained is in CGPA, then minimum of 6.5 CGPA should be obtained on a 10-point scale. In case, JAM / JEST scores are not available, a B.Sc. cut off marks of > 70% may be fixed for admission.	This suggestion will be further discussed with the competent authority for further action.

Department of Biotechnology

Subject:

Opening of a new programme of M.Sc. in Life Sciences starting from the academic year 2020-21.

Prelude:

The NIT Seat Matrix Restructuring Committee (during 2016-17 w.r.t. a MHRD circular dated 10th Feb, 2017) consisting of Dean (Academic), Dean (Research & Consultancy) and Dean (Planning & Development) proposed the following new programs to be started in the 45th Senate meeting of NIT Durgapur dated March 15, 2017.

- a) Integrated M.Sc. (Life Science) program (admission through JEE Main) effective from academic session 2017-18.
- b) M.Sc. (Life Science) program (Admission through CCMN) effective from academic session 2021-22.
- c) Integrated PhD (Life Science) program (Admission through CCMN) effective from academic session 2017-18.

The Department resolved to implement only the M.Sc. (Life Science) program (Admission through CCMN) effective from academic session 2017-18 or 2018-19 (Vide Ref: DAC resolutions dated 20.03.2017. and 04.04.2017 and Department's communications to Dean (Academic) and Registrar on 26.03.2017.).

However, the program could not be started earlier as it was already floating a new course named "Life Science" for all of the first year B.Tech. students since the academic session 2017-18 and the department also did not have enough faculty strength to run any additional program.

In the recent days, Life Sciences or Biological Sciences is being taught in quite a few prominent IITs / NITs (such as IIT Delhi and Chennai have MS programmes and NIT Rourkela has M.Sc. programme) and definitely in IISERs as a subject of wider interest.

No model curriculum for M.Sc. in Life Sciences is available from UGC as of now although it is available for Biochemistry, Microbiology etc. (UGC Regulations, 2003). However, the existing model curricula and relevant regulations are not rigid in structure and rather provide enough flexibility in design so that students can benefit as much as possible.

Thus, the proposed curriculum for M.Sc. (Life Science) has been developed to address the need of the hour for the students in the country. The curriculum needs to be designed in such a way that the students get enough time for research activities and they are better prepared for the future. This is possible only if we think differently.

K. Mahanta

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The M.Sc. Life Science curriculum has been framed keeping in mind the following:

1. UGC-CSIR NET Syllabus as follows (which will be useful for our students in future):
 - i. Molecules and their Interaction Relevant to Biology
 - ii. Cellular Organization
 - iii. Fundamental Processes
 - iv. Cell Communication and Cell Signaling
 - v. Developmental Biology
 - vi. System Physiology – Plant
 - vii. System Physiology – Animal
 - viii. Inheritance Biology
 - ix. Diversity of Life Forms
 - x. Ecological Principles
 - xi. Evolution and Behavior
 - xii. Applied Biology
 - xiii. Methods in Biology
2. Consideration of Curricula of JNU (SLS), NIT Rourkela (DLS), BS-MS programs of IISER, Kolkata, Mohali & Pune, which will make it competitive in nature.

Special features of the M.Sc. (Life Science) Programme:

1. This programme offers a balanced combination of classroom lessons and research activities.
2. This programme is unique in that theory course have been kept only in the first two semesters, which will enable the students have enough time to do some project work and learn significantly by actually doing experiments.
3. The students will get comprehensive exposure to research work as they have to do lab rotations and project work during the entire 3rd and 4th semesters. This will increase the practical knowledgebase of the students.
4. One of the major aims of this programme is to encourage the innovative ideas of the students and provide them with excellent research facilities. Emphasis on the bench-work is expected to make students future-ready to either go for higher studies or join R & D sector in suitable public and private organizations.
5. The students will get enough opportunity to develop their areas of specializations as they will be carrying out their research project work in different laboratories where they would have options in selecting specific areas of research.
6. Additionally, there are also possibilities to have a few invited lectures to be attended mandatorily by the students.

Eligibility: B. Sc. in any branch of Life Sciences/Chemistry/ Physics

Proposed no. of seats: 15

Curriculum of M.Sc.Life Sciences

First Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 1001	Biochemistry	4	0	0	4
2	LS 1002	Microbiology & Molecular Biology	4	0	0	4
3	LS 1003	Methods in Biology	3	0	0	3
4	LS 1004	Cell Biology & Molecular Genetics	4	0	0	4
5	LS 1005	Physiology, Ecology & Evolution	3	0	0	3
6	LS 1006	Biochemistry Laboratory	0	0	3	1.5
7	LS 1007	Microbiology Laboratory	0	0	3	1.5
8	LS 1008	Cellular and Molecular Biology Laboratory	0	0	4	2
		Total Credit				23

Second Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 2001	Omics & Bioinformatics	3	0	1	4
2	LS 2002	Immunology & Cancer Biology	4	0	0	4
3	LS 2003	Biophysics & Structural Biology	4	0	0	4
4	LS 2004	Developmental Biology & Signal Transduction	3	0	0	3
5	LS 2005	Enzymology & Bioenergetics	3	0	0	3
6	LS 2006	Immunology Laboratory	0	0	3	1.5
7	LS 2007	Enzymology Laboratory	0	0	3	1.5
8	LS 2008	Bioinformatics and Structural Biology Laboratory	0	0	4	2
		Total Credit				23

Third Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 3001	Project Work - I	0	0	30	15
2	LS 3002	Project Seminar - I	0	0	2	2
3	LS 3003	Project Viva - I	0	0	3	3
4	LS 3004	Scientific Communications	1	1	0	2
		Total Credit				22

Fourth Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 4001	Project Work - II	0	0	30	15
2	LS 4002	Project Seminar - II	0	0	2	2
3	LS 4003	Project Viva - II	0	0	3	3
2	LS 4004	Project Writing & Presentation	1	1	0	2
		Total Credit				22

Total Program Credit: 90

Syllabus:

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 1001	Biochemistry	PCR	4	0	0	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p>History of Biochemistry. Diversities of biomolecules: carbohydrates (Monosaccharides and derivatives of sugars, polysaccharides), nucleic acids, lipids (Fatty acids, triacylglycerols, glycerophospholipids, sphingolipids, cholesterol lipid bilayers), proteins (glycoproteins, nucleoproteins, lipoproteins etc.). Role of small molecules and trace elements in biology. Structure of amino acids, peptide bonds, Ramachandran Plot, Structural organization of Proteins: Motifs, domains, super secondary structures of proteins.</p> <p>Basic concepts, Central role of ATP in metabolism, Carbon fuel and its oxidation, Concept of energy rich compounds and intermediates, Common types of reactions involved in metabolism, Glycolysis and gluconeogenesis, Energetics and ATP productions, Regulation of glycolysis, glycogen synthase, metabolic flux and its regulation by various metabolic intermediates, TCA cycle, its regulation, its role in energy generation, its role in generating biosynthetic intermediates, Redox reaction, mitochondrial structure and its role in energy metabolism, electron transport system, ATP synthesis and chemo-osmotic hypothesis of ATP generation, Pentose phosphate pathway and its importance in biosynthetic reactions, Glycogen synthesis, breakdown and its regulation, Fatty acid biosynthesis and degradation, Synthesis and degradation of steroids, Amino acid metabolism, Urea cycle, one carbon reaction, non-protein amino acids, amines and their role in cell function, Nucleotide biosynthesis and metabolism, salvage pathways, its regulation and diseases, Special topics in biochemistry. Mechanisms of hormone action, Role of post-translation modifications in regulation of cell function.</p>						
Text Books, and/or reference material	Text Books: 1. Biochemistry (5th Edition) by Jeremy Berg, John Tymoczko and Lubert Stryer, 2. Biochemistry (3rd Edition) by Donald J. Voet and Judith G. Voet. 3. Lehninger Principles of Biochemistry (4th Edition) by David L. Nelson and Michael M. Cox.						

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 1002	Microbiology & Molecular Biology	PCR	4	0	0	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Microbiology</u> History of microbiology: Theory of spontaneous generation Experiments of Pasteur and Tyndall, Koch's Postulates, Isolation of bacteria, methods of sterilization. Role of bacteria in human welfare: Biological concepts – Immunization (Pasteur experiment Antibiosis), (penicillin story), The Microbial cell: General organization of cell, Prokaryotes Eukaryotes and Archaea, Cell wall organization on Prokaryotes, Eukaryotes and Archaea, Cell surface appendages pilli, locomotion by flagella chemotactic Movement, Peptidoglycan synthesis inhibitors in different steps. Changing concepts in microbiology taxonomy, Earlier systems, Molecular taxonomy, Jackard's similarly coefficients. Growth and nutrition: Growth kinetics, Batch and continuous cultures, Nutritional classification of microorganisms, Nutritional uptake by microorganisms (C.N.P). Metabolic Pathways: Metabolic versatility of microbes, Anaerobic Carbon metabolism: Aerobic Carbon metabolism: Nitrogen metabolism; Nitrogen Fixation, Regulation of 'nif. Energy Metabolism: Chemo autotrophs, Hydrogen bacteria, Phototrophic bacteria/Cyanobacteria. Microbial Genetics: Modes of genetic exchange in microbes, Transformation, Transduction, Conjugation, Evolutionary Significance. Microbes in Extreme Environment: The basis of extremophiles and their applications, Life of a thermophile (Thermus, Pyrococcus). Microbes and Agriculture: Symbiotic nitrogen fixation, Rhizobium, Cyanobacteria (Anabaena, Azolla etc.), Mycorrhiza, Clinical Microbiology, Survey of disease causing microbes, Mechanisms of Pathogenesis, Antibiotics and their targets, Immune response elicited by microorganisms. Industrial Microbiology: Major industrial products from microbes, Beverages, Antibiotics, Secondary metabolites, Recombinant products. Environmental Microbiology: Nature of anthropogenic wastes, Municipal wastes and xenobiotics, Enrichment cultures, Xenobiotic degrading consortia, Bioremediation.</p> <p><u>Molecular Biology</u> Genetic material (Classical experiments: Griffith's experiment, Avery... and McCarty's experiment). Macromolecules and Organization: DNA, RNA: Structure, Conformation, Denaturation, Renaturation. Chromatin structure, Nucleosome. Genes and genome organization. Transposons and retrotransposons. Processes: DNA Replication-mechanism-Prokaryotes/eukaryotes, DNA damage repair. RNA world and RNA Replication.</p>						

	<p>Mechanism of transcription- Prokaryotes/eukaryotes. RNA processing: capping, polyadenylation, splicing, editing. Genetic code and translation. Regulation: Transcriptional regulation- Prokaryotes/eukaryotes. Translational regulation. Epigenetics. Genetic Engineering. Gene silencing and Gene editing.</p>
<p>Text Books, and/or reference material</p>	<p>Text Books:</p> <p><u>Microbiology</u></p> <ol style="list-style-type: none"> 1. Microbiology, J.G. Cappuccino, N. Sherman, Pearson Education Publications 2. Essential Microbiology, Stuart Hogg, John Wiley and Sons Limited 3. Microbiology: A Human Perspective, E.W. Nester, D.G. Anderson, C.E. Roberts, N.N. Pearsall, M. T. Nester McGraw Hill Higher Education 5. Culture of Animal Cells, A Manual of Basic Technique. R. I. Freshney, Wiley 6. Liss Publications 7. Manual of Environmental Microbiology, C. J. Hurst, R.L.Crawford, 8. G.R.Knudsen, M.J. McInerney, L.D. Stetzenbach,, ASM Press. 9. Microbiology, L.M. Prescott, J. P. Harley, D.A., Klein, McGraw Hill 10. General Microbiology. H.G. Schlegel, Cambridge University Press. 11. Microbiology by Pelczar. <p><u>Molecular Biology</u></p> <ol style="list-style-type: none"> 1. Genes IX. Lewin (2008) 2. Molecular Biology of the Gene. Watson et. al. (6th edn., 2009) 3. Molecular Cell Biology. Lodish et. al. (6th edn., 2008) 4. Molecular Biology of the Cell. Alberts et. al. (5th edn.,2007).

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 1003	Methods in Biology	PCR	3	0	0	3	3
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p>Microscopic techniques and its applications: Principles and application of following microscopes and microscopy techniques: Light and phase contrast; Fluorescence; Confocal; FRET; FRAP; TIRF; Electron (TEM and SEM); Electron tunnelling and Atomic Force Microscopy.</p> <p>Centrifugation techniques and its applications: Basic principles and calculations (RCF, Sedimentation coefficient etc.); Centrifuges and rotor designs and safety measures for operation (micro-centrifuge, high speed & ultracentrifuges; fixed angle, swing bucket and continuous flow rotors); Preparative centrifugation (differential & density gradient) and its applications (cell fractionation); Analytical centrifugation and its application (sedimentation velocity and sedimentation equilibrium).</p> <p>Chromatographic techniques and its applications: General principles of chromatography; TLC and Paper chromatography; Chromatographic methods for macromolecule separation – Gel-permeation, Ion exchange, Hydrophobic, Reverse-phase and Affinity chromatography; HPLC and FPLC; Criteria of protein purity, Ultrafiltration and other membrane techniques, dialysis.</p> <p>Electrophoretic techniques and its applications: Principles and application of gel electrophoresis, Agarose gel electrophoresis; SDS PAGE; Capillary gel electrophoresis; Isoelectric focusing and 2D-PAGE; Pulse field electrophoresis; Micro-electrophoresis.</p> <p>Radioisotope techniques and its applications: Principles of radioisotopes and radiations; Units of radioactivity; Radioactive & stable isotopes; Measurement of radioactivity (Geiger-Muller counter; Solid & Liquid scintillation counters); Autoradiography; Measurement of stable isotopes. Use of radioactivity in biochemistry.</p> <p>Immunological Techniques: antibody generation, detection of molecules using ELISA, RIA, Western blot, immunoprecipitation, flow cytometry, immunofluorescence microscopy.</p> <p>Advanced Techniques: Mass Spectrometry: API-electrospray and MALDI-TOF; LC MS/MS; Enzyme and cell immobilization techniques; DNA & Peptide Synthesis.</p>						
Text Books, and/or reference material	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Keith Wilson and John Walker, Principles and Techniques of Practical Biochemistry, 8th Edition, Cambridge University Press, 2018. 2. Freifelder D., Physical Biochemistry, Application to Biochemistry and Molecular Biology, 2nd Edition, W.H. Freeman & Company, San Fransisco, 1982. 3. Debajyoti Das. Biophysics & Biophysical Chemistry. 						

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 1004	Cell Biology & Molecular Genetics	PCR	4	0	0	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Cell Biology</u></p> <p>Introduction to the Cell: The evolution of the cell, From molecules to first cell, From Prokaryotes to eukaryotes, From single cells to multicellular organisms. The Plasma membrane, Membrane structure: The Lipid bilayer, Membrane proteins, Membrane carbohydrates, Membrane transport of small molecules, Membrane transport of macromolecules and particles. The Cell nucleus and subnuclear organization: Organelles to the eukaryotic cell: The lysosomes, The peroxisomes, The Golgi apparatus, The endoplasmic reticulum. Mitochondria and chloroplast, Structure of the mitochondria and chloroplast, Protein sorting in different cellular compartments and locations organelle biogenesis and protein secretion. vesicular traffic and secretory pathway, exocytosis and endocytosis. The cytoskeleton, the nature of cytoskeleton, Intermediate filaments, Microtubules, Actin filaments, Cilia and centrioles, Organization of the cytoskeleton. Cell growth and division, Overview of the Cell cycle and its control, the molecular mechanisms for regulating mitotic events, Cell cycle control in mammalian cells, Checkpoints in cell cycle regulation. Cell adhesions, cell junctions and the extracellular matrix, Cell to cell adhesion and communication. Stem cells and cellular differentiation.</p> <p><u>Molecular Genetics</u></p> <p>Mendelian Genetics: An overview Law of segregation and independent assortment, chromosome theory of inheritance. Allelic and non-allelic interactions: Concept of alleles, types of dominance, lethal alleles, multiple alleles, test of allelism, complementation, epistasis, Linkage and recombination, nondisjunction, gene mapping in Drosophila. Changes in chromosome number and structure: Polyploidy, aneuploidy, deletion, inversion, duplication, and translocation. Sex-linked inheritance and extrachromosomal inheritance. Non-Mendelian/quantitative genetics: Genes and environment, heritability, penetrance and expressivity. Mutation: Types, mechanism and role in creating genetic variation/evolution. Bacterial genetics: Transformation, conjugation, and transduction. Human Genetics, Plant Genetics- including molecular markers, Population Genetics.</p>						

Text Books, and/or reference material	<p>Text Books:</p> <p>Cell Biology:</p> <p>1. Essential Cell Biology: An Introduction to the Molecular Biology of the Cell, B. Alberts, D. Bray, A. Johnson, J. Lewis, M. Roff, K. Robert, P. Walter and K. Roberts, Garland Publishing Company 2. Cell and Molecular Biology, DeRobertis, B. I. Publication Pvt. Ltd 3. Molecular Cell Biology, H. Lodish, A. Berk, S.L. Zipursky, P. Matsudaura, D. Baltimore and J. Danell, W.H. Freeman and Company. 4. Essential Cell Biology: An Introduction to the Molecular Biology of the Cell, B. Alberts, D. Bray, A. Johnson, J. Lewis, M. Roff, K. Robert, P. Walter and K. Roberts, Garland Publishing Company.</p> <p>Molecular Genetics</p> <p>1. An introduction to Genetic Analysis by Griffiths et al. 2. Genetics: Analysis of Genes and Genomes by Hartl and Ruvolo 3. Genetics: A conceptual approach by Pierce et al.</p>
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Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 1005	Physiology, Ecology & Evolution	PCR	3	0	0	3	3
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Evolution and physiology</u></p> <p>Introduction: Introduction to evolutionary physiology and its role in medicine; Evolutionary physiology toolkit (understanding how genotype and environment influence physiological traits; the comparative method).</p> <p>Interactions among genotype, phenotype, physiological performance, and fitness: Enzyme polymorphisms –controlling nutrient flow through pathways. Regulatory polymorphisms –controlling when, where and how much genes are expressed.</p> <p>Role of evolutionary processes in engendering or limiting physiological evolution: Detecting adaptation; Physiological plasticity; Trade-offs and constraints in physiological evolution; Mapping genotype to phenotype using evolutionary physiology.</p> <p>Ecological and phylogenetic patterns of physiological evolution: Major physiological transitions (endothermy, flight, multicellularity); Evolution of quantitative traits (locomotor performance, growth and development, energetics).</p> <p><u>Environmental influences on physiological evolution</u></p> <p>Oxygen and carbon dioxide: Physiological and evolutionary responses to oxygen and carbon dioxide; Hypoxia and hyperoxia; Ocean acidification.</p> <p>Temperature: Thermal physiology; Thermal tolerances; Thermal effects on energetics.</p> <p>Seasonality: Physiological responses to seasonal fluctuations; Regulation of dormancy; Cross seasonal consequences of fluctuating selection.</p> <p>Water balance: Osmoregulation and water balance physiology; Desiccation tolerance in terrestrial organisms; Osmoregulation in aquatic animals.</p>						

	<p><u>Global change - can evolutionary physiology help predict the future?</u></p> <p>Global change predictions and impact on physiological; Mechanistic models; Predicting biotic impacts of climate change; Case study: Willow leaf beetles in the Sierra Nevada mountains.</p>
Text Books, and/or reference material	<p>Text Books:</p> <p>1. An Introduction to Molecular Evolution and Phylogenetics 2 nd UK ed. Edition by Lindell Bromham. 2. Integrative Organismal Biology 1st Edition by Lynn B. Martin, Cameron K. Ghalambor, H. Arthur Woods.</p>

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 2001	Omics & Bioinformatics	PCR	3	0	1	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Omics</u> Definition, classification, and scopes. The emergence of proteome concept: structural and functional proteomes, protein structure related to functional kinetics. Proteome analysis: 2-D PAGE, mass spectrometry and mass fingerprinting, LC-MS/MS and PTM analysis. Quantitative Proteomics, Proteomics in relation to animal and plant health and welfare. Transcriptomes: measurement of gene expression. Genome and genome analysis. Bridging genomics to proteomics. Metagenomics. Metabolomics. Protein protein interaction and interactome. Systems biology.</p> <p><u>Bioinformatics</u> Brief description of the Course, biological data, data mining, databases. Examples of different databases, Database searching, Boolean operators, SRS. Practical on databases and database searching. Nucleic acid sequences, simple sequence features, such as GC content, skew ness, Motifs, manipulation of sequences. Practical on nucleic acid sequences. Amino acid sequences of proteins and their manipulation, motifs and domains, Practical on proteins. Concept of sequence alignment and similarity, different algorithms, global and local alignment, scoring systems, Practical on sequence alignment. Multiple sequence alignment, theory and practical. Phylogenetic tree construction, theory and practical. Protein structure, 3D viewer, simple structure manipulation both theory and practical. Biostatistics.</p>						
Text Books, and/or reference material	Text Books: Omics 1. A Textbook of Protein and Proteomics, C Subramanian and Nandan Hazare, Dominant Pub. 2. Discovering Genomics, Proteomics and Bioinformatics (2nd Edition), by A. Malcolm Campbell and Laurie J. Heyer. Bioinformatics 1. Bioinformatics..., edited by Des Higgins and Willie Taylor; Oxford University Press 2. Bioinformatics by Orpita Basu and Simminder K Thukral, Oxford Higher Education 3. Introduction to Bioinformatics by Arthur M Lesk, Oxford University Press.						

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 2002	Immunology & Cancer Biology	PCR	4	0	0	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Immunology</u></p> <p>Introduction to Immune System, organs, cells and molecules involved in Innate and Adaptive Immunity. Mechanisms of barrier to entry of microbes/pathogens. Hematopoiesis and its regulation: Differentiation of stem cells to different cellular elements in blood, role of cytokines. Introduction to inflammatory reaction: chemokines, adhesion molecules, migration of leukocytes to the site of infection, phagocytosis and microbicidal mechanisms. Immediate hypersensitivity: role of eosinophils, and mast cells. Asthma. IgE receptor, prostaglandins and leukotrienes. Receptors of innate immunity: Toll-like receptors and sensing of PAMPs, signal transduction, opsonization, Fc receptors. Antigens, antigenicity, and immunogenicity. B and T cell epitopes. Antibody structure and function (classification of immunoglobulins, immunoglobulin domains, concept of variability, isotypes, allotypes and idiotypic markers). Antigen-antibody interactions. Immunoglobulin genes, VJ/VDJ rearrangements and genetic mechanisms responsible for antibody diversity, affinity maturation, allelic exclusion. Class switching, receptor and soluble forms of immunoglobulin. Hybridoma, monoclonal antibodies, and antibody engineering. The complement system: classical and alternative pathways. Major Histocompatibility Complex: genetic organization of H2 and HLA complexes. Class I and class II MHC molecules, structure and function. Antigen processing and presentation pathways. Differentiation and activation of B cells, BCR and pre BCR, receptor editing. T cell receptors, $\alpha\beta$ and $\gamma\delta$ T cells, receptor diversity. Activation of T cells, APC-T cell interaction, Th1/Th2 cells and cytokines. T cell differentiation in thymus, thymic selection and tolerance to self, MHC restriction, super antigens. Cell-mediated effector functions: Cytotoxic T cells, Natural Killer Cells, ADCC, NK cell receptors, inverse correlation with target MHC expression, missing self hypothesis, cytotoxicity reaction. Topics like Applications of immunological principles (vaccines, and diagnostics); tumor and transplantation Immunology; and diseases of relevance to the immune system (autoimmunity and immunodeficiency) etc.</p> <p><u>Cancer Biology</u></p> <p>Cancer incidence and mortality; origin of neoplastic cells; cancer as cellular disease; tumor cell growth kinetics. Oncogenes and tumor suppressor genes. Environmental carcinogens; carcinogen metabolism. Chemical carcinogenesis; initiation, promotion and progression. Mechanism of ultraviolet radiation</p>						

	<p>carcinogenesis (melanoma and non-melanoma skin cancer). Animal models of cancer research; athymic nude mice model; syngeneic mouse model, transgenic mouse model etc. Heredity and cancer; genetic basis of carcinogenesis (e.g. APC mutation and colon cancer). Viral carcinogenesis mechanism. Immunological aspects of cancer; leukemia. Deregulated cell cycle progression in cancer. Aberrant cell signaling in cancer. Antiapoptotic mechanisms for the survival of cancer cells. Tumor angiogenesis and its molecular mechanisms. Mechanisms of cancer invasion and metastasis. Cancer therapeutics: surgery, radiation and chemotherapy. Chemoprevention of cancer. Immunotherapy of cancer.</p>
<p>Text Books, and/or reference material</p>	<p>Text Books: <u>Immunology</u> 1. Roitt's Essential Immunology 2. Immunobiology: The immune system in health and disease by Charles Janeway et al 3. Kuby Immunology 4. Relevant review articles/research papers/handouts provided in the course.</p> <p><u>Cancer Biology</u> 1. Molecular Biology of Cancer by F. Macdonald, C.H.J. Ford, and A.G. Casson; Garland Science / Bios Scientific Publishers 2. Molecular Biology of Human Cancers by Wolfgang Arthur Schulz Springer.</p>

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 2003	Biophysics & Structural Biology	PCR	4	0	0	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p>Introduction. Structure of Biomolecules and confirmations of protein and nucleic acids. Secondary, tertiary and quaternary structure of protein. Primary and secondary structure of RNA and DNA. Method of conformational analysis and prediction of conformation. Thermodynamics and kinetics of conformational transition of proteins. Protein folding, techniques for studying Macromolecular structure. Ultra centrifugation Sedimentation velocity and equilibrium determination of molecular weights. Electron microscopy. UV Visible Spectroscopy, Fluorescence Spectroscopy. Circular Dichroism Spectroscopy. Symmetry, space group crystal lattices, brag's law in real & reciprocal space. Nuclear Magnetic Resonance.</p>						
Text Books, and/or reference material	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Biophysical Chemistry by Cantor & P. Schimmel. Vol. I & II 2. Physical Biochemistry by David I Reifelder 3. Protein: Structure 7 molecular Properties by TE Creighton, 4. Introduction to Protein structure by Branden and Tooze 5. Introduction to experimental biophysics by Jay L Nadeau <p>Reference books:</p> <ol style="list-style-type: none"> 5. Textbook of structural biology by Liljas Anders, 6. Principles of Protein structure by G E Schulz and Schirmer, 7. Fundamentals of Protein Structure and function by Engelbert Buxbaum, 8. Protein structure: A practical approach by Creighton, 9. Proteins: Structure and function by James J L'Italien, 9. Biomolecular Crystallography: Principles, Practice and application to structural Biology by Bernhard Rupp, 10. Introduction to Protein Architecture: The structural Biology of proteins by A M Lesk, 11. The physics of proteins:.... by Robert H Austin and Charles E Schulz, 12. Structure and mechanism in protein science by Alan R Fersht 						

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 2004	Developmental Biology & Signal Transduction	PCR	3	0	0	3	3
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Developmental Biology</u></p> <p>Basic Concepts of Development: Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells, Gametogenesis, fertilization and early development: cell surface molecules in sperm-egg recognition in animals; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis.</p> <p>Cell Aggregation and Differentiation; Axes and pattern formation in Drosophila, and chick; organogenesis, development and regeneration in vertebrates; metamorphosis; environmental regulation of normal development.</p> <p>Morphogenesis and Organogenesis in Plants: Embryo sac development and double fertilization in plants. Establishment of symmetry in plants; seed formation and germination Organization of shoot and root apical meristem; shoot and root development, Programmed cell death, aging and senescence. Embryonic development, cellular differentiation, organogenesis, metamorphosis.</p> <p><u>Signal Transduction</u></p> <p>Cell signaling: Hormones and their receptors, cell surface receptors, signal transduction pathways, second messengers, regulation of signaling pathways, signaling through G-protein coupled receptors and receptor tyrosine kinases, bacterial and plant two-component signaling systems, bacterial chemotaxis and quorum sensing. Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation. Specific pathways: - Chromatin Regulation; Ras, MAPK and Ras-MAPK Signaling; Apoptosis/Autophagy, PI3K/Akt Signaling, Translational Control; Ca, cAMP & Lipid Signaling, Cell Cycle/Checkpoint, DNA Damage, Jak/Stat Pathway, NF-κB Signaling, TGF-β/Smad Signaling, Lymphocyte Signaling, Tyrosine Kinase/Adaptors, Angiogenesis, Vesicle Trafficking, Cytoskeletal Signaling, Adhesion, Glucose Metabolism, Wnt/Hedgehog/Notch, Stem Cell/Lineage Markers, Nuclear Receptors. Biotic and abiotic stress signaling in plants. Signaling events related to food intake and digestion, blood pressure regulation, muscle function.</p>						

Text Books, and/or reference material	<p>Text Books:</p> <p><u>Developmental Biology</u></p> <p>1. Developmental Biology by S.F. Gilbert, Sinauer Associates Inc. 2. Plant Physiology, Lincoln Taiz and Eduardo Zeiger, Sinauer Associates.</p> <p><u>Signal Transduction</u></p> <p>1. Molecular Biology of the cell by Bruce Alberts et al, Garland Science Com 2. Molecular cell Biology by Lodish et al, W H Freeman and Company 3. Structure and Function in Cell Signalling by John Nelson, Wiley. 4. The biochemistry of cell by Ernst J. M. Helmreich, Oxford Uni Press.</p>

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 2005	Enzymology & Bioenergetics	PCR	3	0	0	3	3
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Enzymology</u> Rate accelerations in biological systems; Catalysis and historical perspective on enzymes; Overview of applied enzymology and enzyme technology; Enzyme nomenclature; Origins of enzyme catalytic power; Structural basis of enzyme action and characterization of active site residues; Kinetic approaches to understand enzyme action; Michaelis-Menten kinetics; Evaluation of Km, kcat and enzyme inhibition analysis; Concept of an efficient catalyst; Elucidation of kinetic mechanism through initial velocity, product inhibition, pH and isotopic analysis; Role of metal ions in enzyme catalysis; Integration of kinetic, chemical and structural data to describe enzyme action; Control of enzyme activity and its role in regulating metabolism – in vivo enzymology; Frontiers in enzymology: Rational design of an enzyme catalyst, directed evolution, abzymes, non-protein catalysts.</p> <p><u>Bioenergetics</u> Molecular basis of entropy, concept of free energy, standard free energy and measurement of free energy, significance in metabolism. Application of first and second law of thermodynamics to biological systems. Energy rich bonds - ATP and interconversions of nucleotide phosphates. Phosphorylation potential. Biochemical reaction mechanism; Temperature dependency from Arrhenius law; Theoretical prediction of rate constant: Interpretation of batch kinetic data; analysis of intra-particle diffusion and reaction; Kinetics of substrate utilization, product formation and biomass production; Chemical mechanisms of biological energy conversion in mitochondria and chloroplasts, Photosynthesis energy transfer kinetics.</p>						
Text Books, and/or reference material	<p>Text Books: <u>Enzymology</u> 1. Enzymatic reaction mechanisms by C. Walsh. WH Freeman, San Francisco (1979). 2. Enzyme Kinetics by I. Segel. Wiley Interscience, NewYork (1993). 3. An introduction to enzyme and coenzyme chemistry by T. Bugg 2nd Ed., Blackwell Publishers, Oxford (2004). 4. Enzyme Kinetics: Principles and Methods by H. Bisswanger Translated by L. Bubenheim. 5. Wiley-VCH Verlag GmbH, Weinheim, Germany (2002). 6. Fundamentals of Enzyme Kinetics by A. Cornish-Bowden 3rd Edition, Portland Press, London (2004). 7. The enzyme catalysis process by A Cooper</p>						

Bioenergetics

1. Lehninger Principles of Biochemistry 4th Ed by David L. Nelson and Michael M. Cox, WH Freeman and Company. 2. Bioenergetics at a Glance: An Illustrated Introduction (At a Glance) (Paperback) By D. A. Harris. Publisher: Wiley Blackwell 3. Bioenergetics: (Paperback) By Lars Garby and Poul S. Larsen. Cambridge University Press. 4. Principles of Bioenergetics by Vladimir P Skulachev 5. Biothermodynamics by Urs von Stockar 6. Biological Thermodynamics by Donald T Haynie

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 3004	Scientific Communications	PCR	1	1	0	2	2
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p>Topics are likely to include:</p> <ul style="list-style-type: none"> What is science communication for, and why is it important in our society now? Defining science in the public sphere Contemporary issues in science communication Public attitudes and social representations Health and medical communication Environmental communication Ethics in science communication Science and entertainment media Digital media Popular Science Books and magazines 						
Text Books, and/or reference material	<p>Text Books:</p> <ul style="list-style-type: none"> Science Communication: A Practical Guide for Scientists 1st Edition by Laura Bowater and Kay Yeoman The Oxford Handbook of the Science of Science Communication (Oxford Library of Psychology) 1st Edition 2017, by Kathleen Hall Jamieson, Dan Kahan, and Dietram A. Scheufele 						

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 4004	Project Writing & Presentation	PCR	1	1	0	2	2
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p>The course provides a systematic review of the principles and practice of the various modes and forms of scientific communication including scientific papers, technical reports, presentations, and proposal writing</p> <p>The objective of this course is to develop effective skill for 1. Scientific or technical presentation (or poster) 2. Writing technical reports 3. Writing scientific papers 4. Writing research or project proposals</p>						
Text Books, and/or reference material	Text Books: Science Communication: A Practical Guide for Scientists 1st Edition by Laura Bowater and Kay Yeoman						

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Department of Biotechnology**Subject:**

Opening of a new programme of M.Sc. in Life Sciences starting from the academic year 2020-21.

Prelude:

The NIT Seat Matrix Restructuring Committee (during 2016-17 w.r.t. a MHRD circular dated 10th Feb, 2017) consisting of Dean (Academic), Dean (Research & Consultancy) and Dean (Planning & Development) proposed the following new programs to be started in the 45th Senate meeting of NIT Durgapur dated March 15, 2017.

- a) Integrated M.Sc. (Life Science) program (admission through JEE Main) effective from academic session 2017-18.
- b) M.Sc. (Life Science) program (Admission through CCMN) effective from academic session 2021-22.
- c) Integrated PhD (Life Science) program (Admission through CCMN) effective from academic session 2017-18.

The Department resolved to implement only the M.Sc. (Life Science) program (Admission through CCMN) effective from academic session 2017-18 or 2018-19 (Vide Ref: DAC resolutions dated 20.03.2017. and 04.04.2017 and Department's communications to Dean (Academic) and Registrar on 26.03.2017.).

However, the program could not be started earlier as it was already floating a new course named "Life Science" for all of the first year B.Tech. students since the academic session 2017-18 and the department also did not have enough faculty strength to run any additional program.

In the recent days, Life Sciences or Biological Sciences is being taught in quite a few prominent IITs / NITs (such as IIT Delhi and Chennai have MS programmes and NIT Rourkela has M.Sc. programme) and definitely in IISERs as a subject of wider interest.

No model curriculum for M.Sc. in Life Sciences is available from UGC as of now although it is available for Biochemistry, Microbiology etc. (UGC Regulations, 2003). However, the existing model curricula and relevant regulations are not rigid in structure and rather provide enough flexibility in design so that students can benefit as much as possible.

Thus, the proposed curriculum for M.Sc. (Life Science) has been developed to address the need of the hour for the students in the country. The curriculum needs to be designed in such a way that the students get enough time for research activities and they are better prepared for the future. This is possible only if we think differently.

The M.Sc. Life Science curriculum has been framed keeping in mind the following:

1. UGC-CSIR NET Syllabus as follows (which will be useful for our students in future):
 - i. Molecules and their Interaction Relevant to Biology
 - ii. Cellular Organization
 - iii. Fundamental Processes
 - iv. Cell Communication and Cell Signaling
 - v. Developmental Biology
 - vi. System Physiology – Plant
 - vii. System Physiology – Animal
 - viii. Inheritance Biology
 - ix. Diversity of Life Forms
 - x. Ecological Principles
 - xi. Evolution and Behavior
 - xii. Applied Biology
 - xiii. Methods in Biology
2. Consideration of Curricula of JNU (SLS), NIT Rourkela (DLS), BS-MS programs of IISER, Kolkata, Mohali & Pune, which will make it competitive in nature.

Special features of the M.Sc. (Life Science) Programme:

1. This programme offers a balanced combination of classroom lessons and research activities.
2. This programme is unique in that theory course have been kept only in the first two semesters, which will enable the students have enough time to do some project work and learn significantly by actually doing experiments.
3. The students will get comprehensive exposure to research work as they have to do lab rotations and project work during the entire 3rd and 4th semesters. This will increase the practical knowledgebase of the students.
4. One of the major aims of this programme is to encourage the innovative ideas of the students and provide them with excellent research facilities. Emphasis on the bench-work is expected to make students future-ready to either go for higher studies or join R & D sector in suitable public and private organizations.
5. The students will get enough opportunity to develop their areas of specializations as they will be carrying out their research project work in different laboratories where they would have options in selecting specific areas of research.
6. Additionally, there are also possibilities to have a few invited lectures to be attended mandatorily by the students.

Eligibility: B. Sc. in any branch of Life Sciences/Chemistry/ Physics

Proposed no. of seats: 15

Curriculum of M.Sc.Life Sciences

First Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 1001	Biochemistry	4	0	0	4
2	LS 1002	Microbiology & Molecular Biology	4	0	0	4
3	LS 1003	Methods in Biology	3	0	0	3
4	LS 1004	Cell Biology & Molecular Genetics	4	0	0	4
5	LS 1005	Physiology, Ecology & Evolution	3	0	0	3
6	LS 1006	Biochemistry Laboratory	0	0	3	1.5
7	LS 1007	Microbiology Laboratory	0	0	3	1.5
8	LS 1008	Cellular and Molecular Biology Laboratory	0	0	4	2
		Total Credit				23

Second Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 2001	Omics & Bioinformatics	3	0	1	4
2	LS 2002	Immunology & Cancer Biology	4	0	0	4
3	LS 2003	Biophysics & Structural Biology	4	0	0	4
4	LS 2004	Developmental Biology & Signal Transduction	3	0	0	3
5	LS 2005	Enzymology & Bioenergetics	3	0	0	3
6	LS 2006	Immunology Laboratory	0	0	3	1.5
7	LS 2007	Enzymology Laboratory	0	0	3	1.5
8	LS 2008	Bioinformatics and Structural Biology Laboratory	0	0	4	2
		Total Credit				23

Third Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 3001	Project Work - I	0	0	30	15
2	LS 3002	Project Seminar - I	0	0	2	2
3	LS 3003	Project Viva - I	0	0	3	3
4	LS 3004	Scientific Communications	1	1	0	2
		Total Credit				22

Fourth Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 4001	Project Work - II	0	0	30	15
2	LS 4002	Project Seminar - II	0	0	2	2
3	LS 4003	Project Viva - II	0	0	3	3
2	LS 4004	Project Writing & Presentation	1	1	0	2
		Total Credit				22

Total Program Credit: 90

Syllabus:

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 1001	Biochemistry	PCR	4	0	0	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p>History of Biochemistry. Diversities of biomolecules: carbohydrates (Monosaccharides and derivatives of sugars, polysaccharides), nucleic acids, lipids (Fatty acids, triacylglycerols, glycerophospholipids, sphingolipids, cholesterol lipid bilayers), proteins (glycoproteins, nucleoproteins, lipoproteins etc.). Role of small molecules and trace elements in biology. Structure of amino acids, peptide bonds, Ramachandran Plot, Structural organization of Proteins: Motifs, domains, super secondary structures of proteins.</p> <p>Basic concepts, Central role of ATP in metabolism, Carbon fuel and its oxidation, Concept of energy rich compounds and intermediates, Common types of reactions involved in metabolism, Glycolysis and gluconeogenesis, Energetics and ATP productions, Regulation of glycolysis, glycogen synthase, metabolic flux and its regulation by various metabolic intermediates, TCA cycle, its regulation, its role in energy generation, its role in generating biosynthetic intermediates, Redox reaction, mitochondrial structure and its role in energy metabolism, electron transport system, ATP synthesis and chemo-osmotic hypothesis of ATP generation, Pentose phosphate pathway and its importance in biosynthetic reactions, Glycogen synthesis, breakdown and its regulation, Fatty acid biosynthesis and degradation, Synthesis and degradation of steroids, Amino acid metabolism, Urea cycle, one carbon reaction, non-protein amino acids, amines and their role in cell function, Nucleotide biosynthesis and metabolism, salvage pathways, its regulation and diseases, Special topics in biochemistry. Mechanisms of hormone action, Role of post-translation modifications in regulation of cell function.</p>						
Text Books, and/or reference material	Text Books: 1. Biochemistry (5th Edition) by Jeremy Berg, John Tymoczko and Lubert Stryer, 2. Biochemistry (3rd Edition) by Donald J. Voet and Judith G. Voet. 3. Lehninger Principles of Biochemistry (4th Edition) by David L. Nelson and Michael M. Cox.						

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 1002	Microbiology & Molecular Biology	PCR	4	0	0	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Microbiology</u> History of microbiology: Theory of spontaneous generation Experiments of Pasteur and Tyndall, Koch's Postulates, Isolation of bacteria, methods of sterilization. Role of bacteria in human welfare: Biological concepts – Immunization (Pasteur experiment Antibiosis), (penicillin story), The Microbial cell: General organization of cell, Prokaryotes Eukaryotes and Archaea, Cell wall organization on Prokaryotes, Eukaryotes and Archaea, Cell surface appendages pilli, locomotion by flagella chemotactic Movement, Peptidoglycan synthesis inhibitors in different steps. Changing concepts in microbiology taxonomy, Earlier systems, Molecular taxonomy, Jackard's similarly coefficients. Growth and nutrition: Growth kinetics, Batch and continuous cultures, Nutritional classification of microorganisms, Nutritional uptake by microorganisms (C.N.P). Metabolic Pathways: Metabolic versatility of microbes, Anaerobic Carbon metabolism: Aerobic Carbon metabolism: Nitrogen metabolism; Nitrogen Fixation, Regulation of 'nif'. Energy Metabolism: Chemo autotrophs, Hydrogen bacteria, Phototrophic bacteria/Cyanobacteria. Microbial Genetics: Modes of genetic exchange in microbes, Transformation, Transduction, Conjugation, Evolutionary Significance. Microbes in Extreme Environment: The basis of extremophiles and their applications, Life of a thermophile (Thermus, Pyrococcus). Microbes and Agriculture: Symbiotic nitrogen fixation, Rhizobium, Cyanobacteria (Anabaena, Azolla etc.), Mycorrhiza, Clinical Microbiology, Survey of disease causing microbes, Mechanisms of Pathogenesis, Antibiotics and their targets, Immune response elicited by microorganisms. Industrial Microbiology: Major industrial products from microbes, Beverages, Antibiotics, Secondary metabolites, Recombinant products. Environmental Microbiology: Nature of anthropogenic wastes, Municipal wastes and xenobiotics, Enrichment cultures, Xenobiotic degrading consortia, Bioremediation.</p> <p><u>Molecular Biology</u> Genetic material (Classical experiments: Griffith's experiment, Avery... and McCarty's experiment). Macromolecules and Organization: DNA, RNA: Structure, Conformation, Denaturation, Renaturation. Chromatin structure, Nucleosome. Genes and genome organization. Transposons and retrotransposons. Processes: DNA Replication-mechanism-Prokaryotes/eukaryotes, DNA damage repair. RNA world and RNA Replication.</p>						

	<p>Mechanism of transcription- Prokaryotes/eukaryotes. RNA processing: capping, polyadenylation, splicing, editing. Genetic code and translation. Regulation: Transcriptional regulation- Prokaryotes/eukaryotes. Translational regulation. Epigenetics. Genetic Engineering. Gene silencing and Gene editing.</p>
<p>Text Books, and/or reference material</p>	<p>Text Books:</p> <p><u>Microbiology</u></p> <ol style="list-style-type: none"> 1. Microbiology, J.G. Cappuccino, N. Sherman, Pearson Education Publications 2. Essential Microbiology, Stuart Hogg, John Wiley and Sons Limited 3. Microbiology: A Human Perspective, E.W. Nester, D.G. Anderson, C.E. Roberts, N.N. Pearsall, M. T. Nester McGraw Hill Higher Education 5. Culture of Animal Cells, A Manual of Basic Technique. R. I. Freshney, Wiley 6. Liss Publications 7. Manual of Environmental Microbiology, C. J. Hurst, R.L.Crawford, 8. G.R.Knudsen, M.J. McInerney, L.D. Stetzenbach,, ASM Press. 9. Microbiology, L.M. Prescott, J. P. Harley, D.A., Klein, McGraw Hill 10. General Microbiology. H.G. Schlegel, Cambridge University Press. 11. Microbiology by Pelczar. <p><u>Molecular Biology</u></p> <ol style="list-style-type: none"> 1. Genes IX. Lewin (2008) 2. Molecular Biology of the Gene. Watson et. al. (6th edn., 2009) 3. Molecular Cell Biology. Lodish et. al. (6th edn., 2008) 4. Molecular Biology of the Cell. Alberts et. al. (5th edn.,2007).

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 1003	Methods in Biology	PCR	3	0	0	3	3
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p>Microscopic techniques and its applications: Principles and application of following microscopes and microscopy techniques: Light and phase contrast; Fluorescence; Confocal; FRET; FRAP; TIRF; Electron (TEM and SEM); Electron tunnelling and Atomic Force Microscopy.</p> <p>Centrifugation techniques and its applications: Basic principles and calculations (RCF, Sedimentation coefficient etc.); Centrifuges and rotor designs and safety measures for operation (micro-centrifuge, high speed & ultracentrifuges; fixed angle, swing bucket and continuous flow rotors); Preparative centrifugation (differential & density gradient) and its applications (cell fractionation); Analytical centrifugation and its application (sedimentation velocity and sedimentation equilibrium).</p> <p>Chromatographic techniques and its applications: General principles of chromatography; TLC and Paper chromatography; Chromatographic methods for macromolecule separation – Gel-permeation, Ion exchange, Hydrophobic, Reverse-phase and Affinity chromatography; HPLC and FPLC; Criteria of protein purity, Ultrafiltration and other membrane techniques, dialysis.</p> <p>Electrophoretic techniques and its applications: Principles and application of gel electrophoresis, Agarose gel electrophoresis; SDS PAGE; Capillary gel electrophoresis; Isoelectric focusing and 2D-PAGE; Pulse field electrophoresis; Micro-electrophoresis.</p> <p>Radioisotope techniques and its applications: Principles of radioisotopes and radiations; Units of radioactivity; Radioactive & stable isotopes; Measurement of radioactivity (Geiger-Muller counter; Solid & Liquid scintillation counters); Autoradiography; Measurement of stable isotopes. Use of radioactivity in biochemistry.</p> <p>Immunological Techniques: antibody generation, detection of molecules using ELISA, RIA, Western blot, immunoprecipitation, flow cytometry, immunofluorescence microscopy.</p> <p>Advanced Techniques: Mass Spectrometry: API-electrospray and MALDI-TOF; LC MS/MS; Enzyme and cell immobilization techniques; DNA & Peptide Synthesis.</p>						
Text Books, and/or reference material	<p>Text Books:</p> <ol style="list-style-type: none"> 1. Keith Wilson and John Walker, Principles and Techniques of Practical Biochemistry, 8th Edition, Cambridge University Press, 2018. 2. Freifelder D., Physical Biochemistry, Application to Biochemistry and Molecular Biology, 2nd Edition, W.H. Freeman & Company, San Fransisco, 1982. 3. Debajyoti Das. Biophysics & Biophysical Chemistry. 						

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 1004	Cell Biology & Molecular Genetics	PCR	4	0	0	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Cell Biology</u></p> <p>Introduction to the Cell: The evolution of the cell, From molecules to first cell, From Prokaryotes to eukaryotes, From single cells to multicellular organisms. The Plasma membrane, Membrane structure: The Lipid bilayer, Membrane proteins, Membrane carbohydrates, Membrane transport of small molecules, Membrane transport of macromolecules and particles. The Cell nucleus and subnuclear organization: Organelles to the eukaryotic cell: The lysosomes, The peroxisomes, The Golgi apparatus, The endoplasmic reticulum. Mitochondria and chloroplast, Structure of the mitochondria and chloroplast, Protein sorting in different cellular compartments and locations organelle biogenesis and protein secretion. vesicular traffic and secretory pathway, exocytosis and endocytosis. The cytoskeleton, the nature of cytoskeleton, Intermediate filaments, Microtubules, Actin filaments, Cilia and centrioles, Organization of the cytoskeleton. Cell growth and division, Overview of the Cell cycle and its control, the molecular mechanisms for regulating mitotic events, Cell cycle control in mammalian cells, Checkpoints in cell cycle regulation. Cell adhesions, cell junctions and the extracellular matrix, Cell to cell adhesion and communication. Stem cells and cellular differentiation.</p> <p><u>Molecular Genetics</u></p> <p>Mendelian Genetics: An overview Law of segregation and independent assortment, chromosome theory of inheritance. Allelic and non-allelic interactions: Concept of alleles, types of dominance, lethal alleles, multiple alleles, test of allelism, complementation, epistasis, Linkage and recombination, nondisjunction, gene mapping in Drosophila. Changes in chromosome number and structure: Polyploidy, aneuploidy, deletion, inversion, duplication, and translocation. Sex-linked inheritance and extrachromosomal inheritance. Non-Mendelian/quantitative genetics: Genes and environment, heritability, penetrance and expressivity. Mutation: Types, mechanism and role in creating genetic variation/evolution. Bacterial genetics: Transformation, conjugation, and transduction. Human Genetics, Plant Genetics- including molecular markers, Population Genetics.</p>						

Text Books, and/or reference material	<p>Text Books:</p> <p>Cell Biology:</p> <p>1. Essential Cell Biology: An Introduction to the Molecular Biology of the Cell, B. Alberts, D. Bray, A. Johnson, J. Lewis, M. Roff, K. Robert, P. Walter and K. Roberts, Garland Publishing Company 2. Cell and Molecular Biology, DeRobertis, B. I. Publication Pvt. Ltd 3. Molecular Cell Biology, H. Lodish, A. Berk, S.L. Zipursky, P. Matsudaura, D. Baltimore and J. Danell, W.H. Preeman and Company. 4. Essential Cell Biology: An Introduction to the Molecular Biology of the Cell, B. Alberts, D. Bray, A. Johnson, J. Lewis, M. Roff, K. Robert, P. Walter and K. Roberts, Garland Publishing Company.</p> <p>Molecular Genetics</p> <p>1. An introduction to Genetic Analysis by Griffiths et al. 2. Genetics: Analysis of Genes and Genomes by Hartl and Ruvolo 3. Genetics: A conceptual approach by Pierce et al.</p>
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Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 1005	Physiology, Ecology & Evolution	PCR	3	0	0	3	3
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Evolution and physiology</u></p> <p>Introduction: Introduction to evolutionary physiology and its role in medicine; Evolutionary physiology toolkit (understanding how genotype and environment influence physiological traits; the comparative method).</p> <p>Interactions among genotype, phenotype, physiological performance, and fitness: Enzyme polymorphisms –controlling nutrient flow through pathways. Regulatory polymorphisms –controlling when, where and how much genes are expressed.</p> <p>Role of evolutionary processes in engendering or limiting physiological evolution: Detecting adaptation; Physiological plasticity; Trade-offs and constraints in physiological evolution; Mapping genotype to phenotype using evolutionary physiology.</p> <p>Ecological and phylogenetic patterns of physiological evolution: Major physiological transitions (endothermy, flight, multicellularity); Evolution of quantitative traits (locomotor performance, growth and development, energetics).</p> <p><u>Environmental influences on physiological evolution</u></p> <p>Oxygen and carbon dioxide: Physiological and evolutionary responses to oxygen and carbon dioxide; Hypoxia and hyperoxia; Ocean acidification.</p> <p>Temperature: Thermal physiology; Thermal tolerances; Thermal effects on energetics.</p> <p>Seasonality: Physiological responses to seasonal fluctuations; Regulation of dormancy; Cross seasonal consequences of fluctuating selection.</p> <p>Water balance: Osmoregulation and water balance physiology; Desiccation tolerance in terrestrial organisms; Osmoregulation in aquatic animals.</p>						

	<p><u>Global change – can evolutionary physiology help predict the future?</u></p> <p>Global change predictions and impact on physiological; Mechanistic models; Predicting biotic impacts of climate change; Case study: Willow leaf beetles in the Sierra Nevada mountains.</p>
Text Books, and/or reference material	<p>Text Books:</p> <p>1. An Introduction to Molecular Evolution and Phylogenetics 2 nd UK ed. Edition by Lindell Bromham. 2. Integrative Organismal Biology 1st Edition by Lynn B. Martin, Cameron K. Ghalambor, H. Arthur Woods.</p>

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 2001	Omics & Bioinformatics	PCR	3	0	1	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Omics</u></p> <p>Definition, classification, and scopes. The emergence of proteome concept: structural and functional proteomes, protein structure related to functional kinetics. Proteome analysis: 2-D PAGE, mass spectrometry and mass fingerprinting, LC-MS/MS and PTM analysis. Quantitative Proteomics, Proteomics in relation to animal and plant health and welfare. Transcriptomes: measurement of gene expression. Genome and genome analysis. Bridging genomics to proteomics. Metagenomics. Metabolomics. Protein protein interaction and interactome. Systems biology.</p> <p><u>Bioinformatics</u></p> <p>Brief description of the Course, biological data, data mining, databases. Examples of different databases, Database searching, Boolean operators, SRS. Practical on databases and database searching. Nucleic acid sequences, simple sequence features, such as GC content, skew ness, Motifs, manipulation of sequences. Practical on nucleic acid sequences. Amino acid sequences of proteins and their manipulation, motifs and domains, Practical on proteins. Concept of sequence alignment and similarity, different algorithms, global and local alignment, scoring systems, Practical on sequence alignment. Multiple sequence alignment, theory and practical. Phylogenetic tree construction, theory and practical. Protein structure, 3D viewer, simple structure manipulation both theory and practical. Biostatistics.</p>						
Text Books, and/or reference material	<p>Text Books:</p> <p>Omics</p> <p>1. A Textbook of Protein and Proteomics, C Subramanian and Nandan Hazare, Dominant Pub. 2. Discovering Genomics, Proteomics and Bioinformatics (2nd Edition), by A. Malcolm Campbell and Laurie J. Heyer.</p> <p>Bioinformatics</p> <p>1. Bioinformatics....., edited by Des Higgins and Willie Taylor; Oxford University Press 2. Bioinformatics by Orpita Basu and Simminder K Thukral, Oxford Higher Education 3. Introduction to Bioinformatics by Arthur M Lesk, Oxford University Press.</p>						

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 2002	Immunology & Cancer Biology	PCR	4	0	0	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Immunology</u></p> <p>Introduction to Immune System, organs, cells and molecules involved in Innate and Adaptive Immunity. Mechanisms of barrier to entry of microbes/pathogens. Hematopoiesis and its regulation: Differentiation of stem cells to different cellular elements in blood, role of cytokines. Introduction to inflammatory reaction: chemokines, adhesion molecules, migration of leukocytes to the site of infection, phagocytosis and microbicidal mechanisms. Immediate hypersensitivity: role of eosinophils, and mast cells. Asthma. IgE receptor, prostaglandins and leukotrienes. Receptors of innate immunity: Toll-like receptors and sensing of PAMPs, signal transduction, opsonization, Fc receptors. Antigens, antigenicity, and immunogenicity. B and T cell epitopes. Antibody structure and function (classification of immunoglobulins, immunoglobulin domains, concept of variability, isotypes, allotypes and idiotypic markers). Antigen-antibody interactions. Immunoglobulin genes, VJ/VDJ rearrangements and genetic mechanisms responsible for antibody diversity, affinity maturation, allelic exclusion. Class switching, receptor and soluble forms of immunoglobulin. Hybridoma, monoclonal antibodies, and antibody engineering. The complement system: classical and alternative pathways. Major Histocompatibility Complex: genetic organization of H2 and HLA complexes. Class I and class II MHC molecules, structure and function. Antigen processing and presentation pathways. Differentiation and activation of B cells, BCR and pre BCR, receptor editing. T cell receptors, $\alpha\beta$ and $\gamma\delta$ T cells, receptor diversity. Activation of T cells, APC-T cell interaction, Th1/Th2 cells and cytokines. T cell differentiation in thymus, thymic selection and tolerance to self, MHC restriction, super antigens. Cell-mediated effector functions: Cytotoxic T cells, Natural Killer Cells, ADCC, NK cell receptors, inverse correlation with target MHC expression, missing self hypothesis, cytotoxicity reaction. Topics like Applications of immunological principles (vaccines, and diagnostics); tumor and transplantation Immunology; and diseases of relevance to the immune system (autoimmunity and immunodeficiency) etc.</p> <p><u>Cancer Biology</u></p> <p>Cancer incidence and mortality; origin of neoplastic cells; cancer as cellular disease; tumor cell growth kinetics. Oncogenes and tumor suppressor genes. Environmental carcinogens; carcinogen metabolism. Chemical carcinogenesis; initiation, promotion and progression. Mechanism of ultraviolet radiation</p>						

	<p>carcinogenesis (melanoma and non-melanoma skin cancer). Animal models of cancer research; athymic nude mice model; syngeneic mouse model, transgenic mouse model etc. Heredity and cancer; genetic basis of carcinogenesis (e.g. APC mutation and colon cancer). Viral carcinogenesis mechanism. Immunological aspects of cancer; leukemia. Deregulated cell cycle progression in cancer. Aberrant cell signaling in cancer. Antiapoptotic mechanisms for the survival of cancer cells. Tumor angiogenesis and its molecular mechanisms. Mechanisms of cancer invasion and metastasis. Cancer therapeutics: surgery, radiation and chemotherapy. Chemoprevention of cancer. Immunotherapy of cancer.</p>
<p>Text Books, and/or reference material</p>	<p>Text Books: <u>Immunology</u> 1. Roitt's Essential Immunology 2. Immunobiology: The immune system in health and disease by Charles Janeway et al 3. Kuby Immunology 4. Relevant review articles/research papers/handouts provided in the course.</p> <p><u>Cancer Biology</u> 1. Molecular Biology of Cancer by F. Macdonald, C.H.J. Ford, and A.G. Casson; Garland Science / Bios Scientific Publishers 2. Molecular Biology of Human Cancers by Wolfgang Arthur Schulz Springer.</p>

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 2003	Biophysics & Structural Biology	PCR	4	0	0	4	4
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p>Introduction. Structure of Biomolecules and confirmations of protein and nucleic acids. Secondary, tertiary and quaternary structure of protein. Primary and secondary structure of RNA and DNA. Method of conformational analysis and prediction of conformation. Thermodynamics and kinetics of conformational transition of proteins. Protein folding, techniques for studying Macromolecular structure. Ultra centrifugation Sedimentation velocity and equilibrium determination of molecular weights. Electron microscopy. UV Visible Spectroscopy, Fluorescence Spectroscopy. Circular Dichroism Spectroscopy. Symmetry, space group crystal lattices, brag's law in real & reciprocal space. Nuclear Magnetic Resonance.</p>						
Text Books, and/or reference material	<p>Text Books: 1. Biophysical Chemistry by Cantor & P. Schimmel. Vol. I & II 2. Physical Biochemistry by David I Reifelder 3. Protein: Structure 7 molecular Properties by TE Creighton, 4. Introduction to Protein structure by Branden and Tooze 5. Introduction to experimental biophysics by Jay L Nadeau</p> <p>Reference books: 5.Textbook of structural biology by Liljas Anders, 6. Principles of Protein structure by G E Schulz and Schirmer, 7. Fundamentals of Protein Structure and function by Engelbert Buxbaum, 8. Protein structure: A practical approach by Creighton, 9. Proteins: Structure and function by James J L'Italien, 9. Biomolecular Crystallography: Principles, Practice and application to structural Biology by Bernhard Rupp, 10. Introduction to Protein Architecture: The structural Biology of proteins by A M Lesk, 11. The physics of proteins:.... by Robert H Austin and Charles E Schulz, 12. Structure and mechanism in protein science by Alan R Fersht</p>						

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 2004	Developmental Biology & Signal Transduction	PCR	3	0	0	3	3
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Developmental Biology</u></p> <p>Basic Concepts of Development: Potency, commitment, specification, induction, competence, determination and differentiation; morphogenetic gradients; cell fate and cell lineages; stem cells, Gametogenesis, fertilization and early development: cell surface molecules in sperm-egg recognition in animals; zygote formation, cleavage, blastula formation, embryonic fields, gastrulation and formation of germ layers in animals; embryogenesis.</p> <p>Cell Aggregation and Differentiation; Axes and pattern formation in Drosophila, and chick; organogenesis, development and regeneration in vertebrates; metamorphosis; environmental regulation of normal development.</p> <p>Morphogenesis and Organogenesis in Plants: Embryo sac development and double fertilization in plants. Establishment of symmetry in plants; seed formation and germination Organization of shoot and root apical meristem; shoot and root development, Programmed cell death, aging and senescence. Embryonic development, cellular differentiation, organogenesis, metamorphosis.</p> <p><u>Signal Transduction</u></p> <p>Cell signaling: Hormones and their receptors, cell surface receptors, signal transduction pathways, second messengers, regulation of signaling pathways, signaling through G-protein coupled receptors and receptor tyrosine kinases, bacterial and plant two-component signaling systems, bacterial chemotaxis and quorum sensing. Cellular communication: Regulation of hematopoiesis, general principles of cell communication, cell adhesion and roles of different adhesion molecules, gap junctions, extracellular matrix, integrins, neurotransmission and its regulation. Specific pathways: - Chromatin Regulation; Ras, MAPK and Ras-MAPK Signaling; Apoptosis/Autophagy, PI3K/Akt Signaling, Translational Control; Ca, cAMP & Lipid Signaling, Cell Cycle/Checkpoint, DNA Damage, Jak/Stat Pathway, NF-κB Signaling, TGF-β/Smad Signaling, Lymphocyte Signaling, Tyrosine Kinase/Adaptors, Angiogenesis, Vesicle Trafficking, Cytoskeletal Signaling, Adhesion, Glucose Metabolism, Wnt/Hedgehog/Notch, Stem Cell/Lineage Markers, Nuclear Receptors. Biotic and abiotic stress signaling in plants. Signaling events related to food intake and digestion, blood pressure regulation, muscle function.</p>						

Text Books, and/or reference material	<p>Text Books:</p> <p><u>Developmental Biology</u></p> <p>1. Developmental Biology by S.F. Gilbert, Sinauer Associates Inc. 2. Plant Physiology, Lincoln Taiz and Eduardo Zeiger, Sinauer Associates.</p> <p><u>Signal Transduction</u></p> <p>1. Molecular Biology of the cell by Bruce Alberts et al, Garland Science Com 2. Molecular cell Biology by Lodish et al, W H Freeman and Company 3. Structure and Function in Cell Signalling by John Nelson, Wiley. 4. The biochemistry of cell by Ernst J. M. Helmreich, Oxford Uni Press.</p>

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 2005	Enzymology & Bioenergetics	PCR	3	0	0	3	3
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p><u>Enzymology</u> Rate accelerations in biological systems; Catalysis and historical perspective on enzymes; Overview of applied enzymology and enzyme technology; Enzyme nomenclature; Origins of enzyme catalytic power; Structural basis of enzyme action and characterization of active site residues; Kinetic approaches to understand enzyme action; Michaelis-Menten kinetics; Evaluation of Km, kcat and enzyme inhibition analysis; Concept of an efficient catalyst; Elucidation of kinetic mechanism through initial velocity, product inhibition, pH and isotopic analysis; Role of metal ions in enzyme catalysis; Integration of kinetic, chemical and structural data to describe enzyme action; Control of enzyme activity and its role in regulating metabolism - in vivo enzymology; Frontiers in enzymology: Rational design of an enzyme catalyst, directed evolution, abzymes, non-protein catalysts.</p> <p><u>Bioenergetics</u> Molecular basis of entropy, concept of free energy, standard free energy and measurement of free energy, significance in metabolism. Application of first and second law of thermodynamics to biological systems. Energy rich bonds - ATP and interconversions of nucleotide phosphates. Phosphorylation potential. Biochemical reaction mechanism; Temperature dependency from Arrhenius law; Theoretical prediction of rate constant: Interpretation of batch kinetic data; analysis of intra-particle diffusion and reaction; Kinetics of substrate utilization, product formation and biomass production; Chemical mechanisms of biological energy conversion in mitochondria and chloroplasts, Photosynthesis energy transfer kinetics.</p>						
Text Books, and/or reference material	<p>Text Books:</p> <p><u>Enzymology</u> 1. Enzymatic reaction mechanisms by C. Walsh. WH Freeman, San Francisco (1979). 2. Enzyme Kinetics by I. Segel. Wiley Interscience, NewYork (1993). 3. An introduction to enzyme and coenzyme chemistry by T. Bugg 2nd Ed., Blackwell Publishers, Oxford (2004). 4. Enzyme Kinetics: Principles and Methods by H. Bisswanger Translated by L. Bubenheim. 5. Wiley-VCH Verlag GmbH, Weinheim, Germany (2002). 6. Fundamentals of Enzyme Kinetics by A. Cornish-Bowden 3rd Edition, Portland Press, London (2004). 7. The enzyme catalysis process by A Cooper</p>						

Bioenergetics

1. Lehninger Principles of Biochemistry 4th Ed by David L. Nelson and Michael M. Cox, WH Freeman and Company. 2. Bioenergetics at a Glance: An Illustrated Introduction (At a Glance) (Paperback) By D. A. Harris. Publisher: Wiley Blackwell 3. Bioenergetics: (Paperback) By Lars Garby and Poul S. Larsen. Cambridge University Press. 4. Principles of Bioenergetics by Vladimir P Skulachev 5. Biothermodynamics by Urs von Stockar 6. Biological Thermodynamics by Donald T Haynie

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 3004	Scientific Communications	PCR	1	1	0	2	2
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p>Topics are likely to include:</p> <p>What is science communication for, and why is it important in our society now?</p> <p>Defining science in the public sphere</p> <p>Contemporary issues in science communication</p> <p>Public attitudes and social representations</p> <p>Health and medical communication</p> <p>Environmental communication</p> <p>Ethics in science communication</p> <p>Science and entertainment media</p> <p>Digital media</p> <p>Popular Science Books and magazines</p>						
Text Books, and/or reference material	<p>Text Books:</p> <p>Science Communication: A Practical Guide for Scientists 1st Edition by Laura Bowater and Kay Yeoman</p> <p>The Oxford Handbook of the Science of Science Communication (Oxford Library of Psychology) 1st Edition 2017, by Kathleen Hall Jamieson, Dan Kahan, and Dietram A. Scheufele</p>						

Department of Biotechnology							
Course Code	Title of the course	Program Core (PCR) / Electives (PEL)	Total Number of contact hours				Credit
			Lecture (L)	Tutorial (T)	Practical (P)	Total Hours	
LS 4004	Project Writing & Presentation	PCR	1	1	0	2	2
Pre-requisites		Course Assessment methods (Continuous (CT) and end assessment (EA))					
NA		CT+EA					
Course Outcomes	<ul style="list-style-type: none"> • CO1: • CO2: • CO3: 						
Topics Covered	<p>The course provides a systematic review of the principles and practice of the various modes and forms of scientific communication including scientific papers, technical reports, presentations, and proposal writing</p> <p>The objective of this course is to develop effective skill for 1. Scientific or technical presentation (or poster) 2. Writing technical reports 3. Writing scientific papers 4. Writing research or project proposals</p>						
Text Books, and/or reference material	Text Books: Science Communication: A Practical Guide for Scientists 1st Edition by Laura Bowater and Kay Yeoman						

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ANNEXURE 56.8.2.1

ANNEXURE 56-8-2-1

NIT, DURGAPUR
DEPARTMENT OF EARTH AND ENVIRONMENTAL STUDIES

NOTE SHEET

01.10.2019

SUB: Submission of Final report and recommendation of Academic committee to introduce 2yrs M.Sc. programme in Applied Geology and Geoinformatics from 2020-21 academic session under Department of Earth and Environmental Studies.

The Academic Committee (enclosed), involving external experts from academia and industries, met twice to discuss in detail of the prospect of the proposed programme, curriculum and syllabi. The committee in its second meeting held on 13.9.2019 finalised the proposal to introduce 2yrs M.Sc. programme in Applied Geology and Geoinformatics including curriculum and syllabi for submission to the authority. The resolution of the meeting including curriculum and syllabi (Annexure - 1) is enclosed. It is to be noted that the proposed programme will receive patronage in the form of delivering some lectures on special topics by faculty members, joint supervision of PG projects from Indian Institute of Remote Sensing (IIRS), Dehradun under ISRO (communications of Director, IIRS and Director NITD are enclosed). The nominee of IIRS has taken active role in formulating curriculum and syllabi of the programme, particularly the geoinformatics part.

Submitted to the Director for consideration and necessary action.

Director

*Pls. arrange to
place it in
the Samant (after PG etc)
for approval of*

01/10/19

M. K. Singh 01/10/19
Head (EES)

2nd Meeting of Academic Committee to introduce a PG programme in Earth Science under the dept. of Earth and Environmental Studies of NIT Durgapur held on 13.09.2019 at the Meeting room of Dept. of EES, NIT Durgapur.

Members present

1. Prof. D. Mukhopadhyay (Emeritus Professor, RCAIS, Kolkata) *D Mukhopadhyay*
2. Prof. Biswajit Mishra (Professor, IIT Kharagpur) *Biswajit Mishra 13/9/19*
3. Prof. Prabir Dasgupta (HOD, Geology, Durgapur Govt. College) *P. Dasgupta 13/9/19*
4. Dr. Partha S. Chakrabarti (Retd. ^{Chief} Principle Scientist, DST-WB) *Partha S. Chakrabarti 13/9/2019*
5. Dr. Debashis Mitra (Group Head Marine Division, IIRS Dehradun) *Debashis Mitra 13/9/2019*
6. Dr. Rajib Dhar (Head Geology, ESSAR India) *Rajib Dhar 13/9/19*
7. Dr. Manoj Kumar Ozha (Assistant Professor, NIT Durgapur) *Manoj Kumar Ozha 13/9/19*
8. Dr. Sandip Mondal (Assistant Professor, NIT Durgapur) *Sandip Mondal 13/9/19*
9. Prof. Kalyan Adhikari (Professor and HOD, EES, NIT Durgapur) *Kalyan Adhikari 13/9/19*

HOD (EES) and Chairman of the committee welcomed all the members and requested to deliver on the following agenda:

- a) Finalisation of curriculum
- b) Finalisation of syllabus of individual course of the programme
- c) Finalisation of no. of student intake
- d) Admission criteria
- e) Assessment of additional requirement of infrastructural facilities and human resource
- f) Anything relevant to the subject

Resolution

1. Members started discussion on agenda item no. **a** and **b** based on the prepared draft and feedback from different members of the committee. After detail discussion the curriculum and syllabi of 2 yrs M.Sc programme on **Applied Geology and Geoinformatics** has been finalised as Annexure-1.
2. Regarding the agenda item no. **c**, the members decided that the programme should be 2 yrs M.Sc with no. of students **intake 20** (following reservation policy of GOI).
3. Under agenda item no. **d** members resolved that **JAM qualified** students will be considered for admission. Additional criteria may be imposed by the departmental academic committee. If all seats are not filled by JAM qualified candidates Institute may formulate an appropriate selection process to fill up the remaining seats.
4. Regarding agenda item no. **e**, the department requires following equipment facilities in addition to the existing facilities
 - a) Student grade microscopes: 10 nos.
 - b) Research Grade microscope: 2 nos.
 - c) Section cutting machine: 1 no.
 - d) Field related tools/equipments (GPS, Clinometer, Burton Compass, Hammer, Haver Sack, etc.)
 - e) Software/s related to the programme
 - i) RS & GIS: Increase in number of license: 5
 - ii) Rockware: Increase in number of license: 5
 - iii) Modflow: Increase in number of license: 5
 - f) Computer : 10 nos
 - g) Stereo zoom microscope(student grade) : 05
 - h) Stereo zoom microscope(research grade): 02
 - i) Spectro radiometer : 01
 - j) Mirror stereoscope with parallax bar : 02
 - k) Pocket stereoscope : 05
 - l) BSE and EDS detectors for already available FE-SEM under COE to be procured for complete analysis of geological samples under SEM.
5. Faculty members in some specialised fields need to be inducted in phased manner. Till then experts from industries and reputed faculty members of institutes/ universities may be involved as visiting faculty in the programme. All the members of the Academic Committee proposed to implement the programme from 2020-21 academic session with at least 5 departmental faculty members.

The meeting concluded with the HOD (EES) extending thanks to the external experts.

Curriculum and Syllabus

Master of Science

In

Applied Geology and Geoinformatics

Duration of Course: Two years (4 Semesters)



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Department of Earth and Environmental Studies

National Institute of Technology Durgapur

Mahatma Gandhi Road, Durgapur, West Bengal, India, Pin -713209

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Date: September 25, 2019

Minutes of the Departmental Postgraduate Academic Committee (DPAC) meeting held on September 25, 2019 at 11.00 a.m in the office of the Head of the Department.

The following members were present in the meeting:

1. Prof. Surabhi Chaudhuri
2. Prof. Apurba Dey,
3. Prof. Sudip Chattopadhyay
4. Prof. Sudit S. Mukhopadhyay
5. Prof. Kaustav Aikat
6. Dr. Debjani Dutta
7. Dr. Kazy Sufia Khannam
8. Dr. Monidipa Ghosh
9. Dr. Subhankar Roy Barman
10. Dr. Ashish Bhattacharjee
11. Dr. Nibedita Mahata
12. Dr. Sougata Saha
13. Dr. Debojyoti De
14. Dr. Sudipta Mandal
15. Dr. Amita Barik
16. Dr. Oindrilla Mukherjee
Department of Biological Sciences
IISER, Kolkata
18. Prof. Amit Das,
Head, School of Life Science
IIT Kharagpur

Chairperson *SC*
 Member *AD*
 Member *SD*
 Member *SM*
 Member *KA*
 Member *DD*
 Member *KS*
 Member *MG*
 Member *SR*
 Member *AB*
 Member *NM*
 Member *SS*
 Member *DD*
 Member *SM*
 Member *AB*
 Member Secretary *AM*

External Expert *AP*
25/9/2019

External Expert *AD*
25/9/19

The resolutions of the meeting are as follows:

1. Several suggestions were given regarding the MSc syllabus and curriculum by the external experts and discussed in the meeting. The details of the suggestions are given in Annexure I.

No note of dissent was recorded in the meeting.

The meeting ended with thanks to the chair and special thanks to the external experts present at the meeting.

SC
 Prof. Surabhi Chaudhuri
 Chairperson, Department of Biotechnology

Suggestions from the experts on M.Sc. (Life Science) program at NIT Durgapur:

1. The tutorial hours may be included in the lecture hours.
2. The syllabus of "Microbiology & Molecular Biology" may be taught according to the student batch considering the heterogeneous population.
3. The syllabus of "Immunology & Cancer Biology" may be taught according to the student batch considering the heterogeneous population.
4. Laboratory names may be mentioned in the curriculum.
5. A few reference books have been suggested to be included for "Biophysics & Structural Biology" and "Enzymology & Bioenergetics".
6. The courses like "Scientific Communications" & "Project Writing & Presentation" may be defined considering aspects of 'research ethics & IPR'.
7. Eligibility degree criteria may be broadened as B.Sc. in any branches of Life Sciences and Physics & Chemistry.
8. The admission policy: it was informed that IIT Kharagpur and IACS, Kolkata jointly conduct an independent examination for their M.Sc. admission. It was suggested whether NIT Durgapur can conduct such an examination for admission to M.Sc. (Life Sciences) either jointly or independently. If not possible, students may be taken through JAM / JEST by fixing up a rank cut-off by the competent authority and a B.Sc. cut off marks of $\geq 60\%$ (Prefinal year / semester, 60% for provisional admission). If the marks obtained is in CGPA, then minimum of 6.5 CGPA should be obtained on a 10-point scale. In case, JAM / JEST scores are not available, a B.Sc. cut off marks of $\geq 70\%$ may be fixed for admission.

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Annexure-1

Curriculum and Syllabi

Master of Science

In

Applied Geology and Geoinformatics

Duration of Course: Two years (4 Semesters)



Department of Earth and Environmental Studies

National Institute of Technology Durgapur

Mahatma Gandhi Road, Durgapur, West Bengal, India, Pin -713209

M.Sc. (Applied Geology and Geoinformatics) SEMESTER SYSTEM w.e.f. SESSION 2020-21

Candidates who have passed the three year B.Sc. (Hons.) examination from a University with Geology as its major subject will be considered eligible for admission to the Four Semester M.Sc. course in Applied Geology and Geoinformatics.

The M.Sc. course in Applied Geology and Geoinformatics shall be imparted to the students for two academic sessions consisting of four semesters as given below. Candidates will be examined and evaluated on grade basis at the end of each semester in the different courses of theory and practical as per the credits given against each course. The M.Sc. Applied Geology and Geoinformatics will consist of (a) Core Courses, (b) Elective Courses, and (c) one Open elective from other department of the institute. (a) The Core courses will be compulsory for all the students admitted to M.Sc. Applied Geology and Geoinformatics.

DEPARTMENT OF EARTH & ENVIRONMENTAL STUDIES				
Curriculum of M.Sc. (APPLIED GEOLOGY AND GEOINFORMATICS)				
FIRST SEMESTER				
Sl. No	Sub. Code	Subjects	L-T-S	Credits
1	ES 1101	Mineral science	3-0-3	4.5
2	ES 1102	Fundamentals of Remote Sensing and Geoinformatics	3-0-3	4.5
3	ES 1103	Structural Geology	3-0-2	4
4	ES 1104	Computer tools and Techniques	0-1-4	3
5	ES 1105	Applied Geomorphology and Quaternary Geology	3-0-3	4.5
6	ES 1151	Comprehensive viva		1
TOTAL				21.5
SECOND SEMESTER				
Sl. No	Sub. Code	Subjects	L-T-S	Credits
1	ES 91**	Elective I	3-0-0	3
2	ES 2101	Natural Hazards and Disaster Management	2-0-0	2
3	ES 2102	Igneous Petrology	2-0-3	3.5
4	ES 2103	Metamorphic Petrology	2-0-3	3.5
5	ES 2104	Geoinformatics in Geosciences	3-0-3	4.5
6	ES 2151	Geology Field Training + Comprehensive viva		3 (2+1)
7	Open El		2-1-0	3
TOTAL				22.5
THIRD SEMESTER				
Sl. No	Sub. Code	Subjects	L-T-S	Credits
1	ES 3101	Hydrogeology	2-0-4	4
2	ES 3102	Fuel Geology	3-0-3	4.5
3	ES 3103	Ore Geology	2-0-3	3.5
4	ES 3104	Engineering Geology	3-0-3	4.5
5	ES 3105	Sedimentology	2-0-3	3.5
6	ES 3151	Research Project-I and Comprehensive viva		3 (2+1)
TOTAL				23
FOURTH SEMESTER				
Sl. No	Sub. Code	Subjects	L-T-S	Credits
1	ES 4101	Environmental Geology	3-0-0	3
2	ES 91**	Elective-II	3-0-0	3
3	ES 91**	Elective-III	3-0-0	3
4	ES 4151	Research Project-II	0-0-14	7
5	ES 4152	Seminar + Comprehensive Viva-Voce		2
TOTAL				18
Sum Total				85

List of Professional Electives							
Sl. No	Sub. Code	Subjects			L-T-S	Credits	
El-I	ES 9101, 02, 03, and 04	Geodynamics	Applied Geochemistry	Isotope Geology and Geochronology	Paleoclimatology	3-0-0	3
El-II	ES 9105, 06, 07, and 08	Exploration Geophysics	Applied Micropalaeontology	Mineral Exploration	Geostatistics	3-0-0	3
El-III	ES 9109, 10, 11, and 12	Hydrocarbon Exploration	Oceanography	Contaminant Hydrogeology	Precambrian Geology	3-0-0	3

COMPULSORY COURSES

ES1101	MINEARAL SCIENCE		L	T	S	C
			3	0	3	4.5
Designation	Compulsory	Course type	Theory + Lab			
Pre-requisites	--	Contact hours:	78			
Department	Earth and Environmental Studies					

Course Content

Unit I: (15 Hours)

Structural formulae; Substitution of elements/solid solution and experimental work on pressure-temperature stability of the minerals; Chemical composition and unit cell content; Crystal structures of common silicate and non-silicate minerals.

Unit II: (15 Hours)

Energetics of crystal systems; Unit Cells; Crystal structure; Symmetry Elements – External and Internal symmetry; Bravais Lattice; Concept of Space group; derivation of 32 point groups; crystal defects; X-ray Diffractometer; Introduction to X-ray crystallography.

Unit III: (12 Hours)

Uniaxial and Biaxial Minerals; Optical Indicatrix, Birefringence, pleochroism and interference phenomena in minerals; dispersion in minerals; Optical anomalies; Optical accessories: quartz, mica, and gypsum plate.

LABORATORY (36 Hours)

Mineralogy: Identification of rock-forming minerals in hand specimens.

Optical Mineralogy: Determination of length fast and length-slow characters of minerals Scheme of pleochroism and absorption of a given mineral in thin section. Determination of extinction angle and composition of plagioclase. Study of interference figures of uniaxial and biaxial crystals, determination of optic signs.

Crystallography: Representation of symmetry elements of crystals belonging to 32 classes of symmetry and study of their stereograms; Indexing and calculation of cell parameters of cubic, tetragonal and hexagonal crystals; Identification of minerals from study of XRD data. Use of SEM; Calculation of structural formula from chemical data.

Essential Reading:

1. D. Perkins, *Mineralogy 3rd Edition* (English, Paperback), Pearson Publications, 2015.
2. D. W. Nesse, *Optical Mineralogy*, McGraw Hill, 1986
3. A. Putnis, *Introduction to Mineral Sciences*, Cambridge University Press, 1992.

Supplementary Reading:

1. P.F. Kerr, *Optical Mineralogy*, McGraw Hill, 1977.
2. P.K. Verma, *Optical Mineralogy*, CRC Press, 2010.

ES1102	Fundamentals of Remote Sensing and Geoinformatics			L	T	S	C
				3	0	3	4.5
Designation	Compulsory	Course type	Theory + Lab				
Pre-requisites	--	Contact hours:	78				
Department	Earth and Environmental Studies						

Course Content

Unit I: (18 Hours)

Overview of Remote Sensing: Definition, concepts and types; Electromagnetic Radiation; Radiometric Terms and Definitions; Radiation laws; EM Spectrum, Sources of EMR, Atmospheric windows, Interaction of EMR with atmosphere and target; Colour concept. Imaging Spectrometry: Spectral signature for various land cover feature; RS Data Acquisition Mechanism, Data Types and Errors; Platform: Types of platforms, ground, airborne and space borne platforms; Basics of Aerial photographs; Orbit of satellite: Kepler's law, satellite characteristics; satellites for earth observation studies and planetary missions (e.g., Chandrayan); Sensors: Types and classification of sensors, Imaging modes, characteristics of optical sensors, Sensor resolution- spectral, spatial, radiometric and temporal; Data quality and sources of RS data: Global and Indian data products Panchromatic (B &W) and False Colour Composite (FCC); Aerial survey using Digital cameras.

Visual image Interpretation: Principles of visual interpretation of aerial photos and satellite imagery; Recognition elements and interpretation keys for Visual Interpretation; techniques of visual interpretation and interpretation equipment; Relief and tilt corrections for aerial photographs; Interpretation of Multispectral Imagery; Principles of Microwave Remote Sensing (imaging and non-imaging), Microwave Bands, Active and Passive Microwave Sensors, Imaging Radar Geometry, Synthetic Aperture Radar (SAR), SAR versus other Earth Observation Instruments; Thermal and Hyper spectral Remote Sensing: Physics of Thermal Remote Sensing, Kinetic & Radiant temperature, emissivity of different material Atmospheric effects, Thermal properties of materials, Satellite Thermal systems (Characteristics of sensors, Resolutions), Characteristics of images and different types of available data products, Thermal Image Interpretation, Information extraction from thermal imagery:

Unit II: (18 Hours)

Fundamentals of GIS: Introduction to GIS, Understand the difference between GIS and Information Systems in general; GIS Components and functions of GIS: Data types and spatial data models; Idea of conceptual, logical and physical models. RDBMS, Database normalization Representation of the real world via a vector and raster representation model; Coordinate systems and map projections, concepts of measurements by triangles traversing, planer polar, and spherical coordinate systems, concept of Datum and its parameters, Horizontal and vertical Datums; Internet GIS, location based services, 3D GIS, crowdsourcing

Data Input and Output: Spatial and Non spatial data: Spatial data and attribute data, their sources, types of attributes; geographical data formats; Spatial input techniques and devices

used; Digitizing, Editing and structuring map data, Topology Creation, concepts of adjacency, connectivity and area (containment); Spaghetti vs topological vector data.

Spatial and Network Analysis: Vector & raster based analysis: Attribute data analysis, Integrated spatial and attribute data analysis: Single and multi-layer raster and vector analysis.

Unit III: (6 Hours)

Introduction to GNSS: History, Transit, Timation, NAVSTAR GPS, GLONASS, GALILEO;

LABORATORY (36 Hours)

Study of Satellite Image Annotation (information) LANDSAT, SPOT and IRS and Referencing Scheme (Analog); Digital Referencing Scheme (NRSC/Digital globe/space imaging etc); IR - Thermal Radiation Measuring Instruments and drawing of Isotherms and plotting diurnal variation curve; Spectral Response Pattern of different Land cover objects; Study of Satellite Imagery (B/W) in Different bands and Visual Interpretation; Ground Data collection instruments, Radiometers, Spectrometers etc. and Ground Data collection in a given area with the help of Radiometers and Spectrometers; Digital Interpretation and preparation of Land use and geological Mapping at 1:50,000 scale; Field exercise on visual Image interpretation and validation using ground data.

Familiarization With GIS Software; Geo-referencing and Projection (Overview of Projections & Datums); Spatial data Entry; Spatial Data Editing & Topology Creation; Linking Spatial and Non Spatial Data Entry; Practical exercise on DBMS; Spatial and Non spatial Query and Analysis (Raster based analysis); Vector Data Analysis, Network Analysis and Modelling; Output Map Generation; Multi criteria Analysis

Essential Reading:

1. J. George, *Fundamentals of Remote Sensing*; University Press (India) Pvt. Ltd., Hyderabad, India, 2005.
2. M. T. Lillesand, W. K. Ralph, J. Chipman, *Remote Sensing and Image Interpretation*, 6th Edition, John Wiley, 2008.
3. J. B. Campbell, *Introduction to Remote Sensing*, Guilford Press, 2002.
4. Sabins, F.F, *Remote sensing: Principles and interpretation*. W.H.Freeman& Co. New York.1986.
5. Jensen, R.Jhon, *The Remote Sensing Process*. 2009
6. Llifffe, Jonathan and Lott, Roiger (2008):*Datum and Map Projections: For Remote sensing and GIS Surveying*. 2nd ed.: CRC Press, 2008
7. Sanjib K. Ghosh (2005): *Fundamentals of Computation Photogrammetry*. Concept Publishing, New Delhi.
8. Kraak Menno-Jan and Ormelling Ferjan (2003). *Cartography: Visualization of Geospatial data*, 3rd ed.,Harlow: Prentice Hall, 2003. IX, 205 p.
9. deMers, M.N. (1997) *Fundamentals of Geographic Information Systems*. John Wiley and Sons.

ES1103	STRUCTURAL GEOLOGY		L	T	S	C
			3	0	2	4
Designation	Compulsory	Course type	Theory + Lab			
Pre-requisites	--	Contact hours:	65			
Department	Earth and Environmental Studies					

Course Content

Unit I: (6 Hours)

Mechanical properties of rocks; Concept of dynamic and kinematic analyses of rocks in two dimensions.

Unit II: (18 Hours)

Mathematical treatment of stress, strain, flow, Strain measurements, Micro-structures and Grain scale deformation mechanisms; Paleostress analysis.

Unit III: (18 Hours)

Superposed fold analysis; Faulting - Thrust Belts, Normal fault systems, Dynamics of faulting; Shear zones – Classification and geometry of different types of shear zones, Strain variation in shear zones, shear sense indicators; GPS and active tectonics; Earthquake and fault analysis.

LABORATORY (24 Hours)

Analysis and interpretation of geological maps; Stereographic analysis of structural data; Use of specialized software, (Ge-orient, Global Mapper, etc.); Stereographic techniques: Significance of contour diagrams: orientation analyses of foliation and lineation data for regional structural geometry; Structural problems related to borehole data; Mohr Circle problems, Rf- ϕ method, Fry method; Microstructures in thin sections; Balanced cross sections.

Essential Reading:

1. Haakon Fossen, *Structural Geology*, Cambridge University Press; 1st edition, 2010.
2. G. H. Davis, S. J. Reynolds, C. F. Kluth, *Structural Geology of Rocks and Regions*, Wiley; 3rd edition, 2011.
3. J. Jaeger, N. G. Cook and R. Zimmerman, *Fundamentals of Rock Mechanics*, Wiley-Blackwell; 4th edition, 2007.
4. S. K. Ghosh, *Structural Geology: Fundamentals and modern development*, Pergamon; 1st edition, 1993.

Supplementary Reading:

1. J.G. Ramsay, M.I. Huber, *Techniques of Modern Structural Geology, Vol. II, Folds and Fractures*, Academic Press, 1987.
2. J.G. Ramsay, R.J. Lisle, *Techniques of Modern Structural Geology, Vol. III (Application of continuum mechanics)*, Academic Press, 2000.

ES1104	COMPUTER TOOLS AND TECHNIQUES			L	T	S	C
				0	1	4	3
Designation	Compulsory	Course type	Lab				
Pre-requisites	--	Contact hours:	40				
Department	Earth and Environmental Studies						

Course Content

Unit I: (15 Hours)

Problem solving using computer program, Algorithm, Data Structures and program, Compilers, Software tools, IDE, Example of common scientific computing languages (C, C++, MATLAB, Python, etc.), Demonstration of program writing and execution using suitable sample examples.

Unit II: (15 Hours)

Familiarising a programming language like SEJLAB or Python, Identifying appropriate libraries related to geoscience and illustrating how to use them.

Unit III: (10 Hours)

Familiarising few popular software tools related to geoscience (such as MODFLOW, ROCK WARE, RSE GLS, Aquachem, PHREEQC, SPSS, etc.)

Essential Reading:

1. Rajaraman V. 2004, Computer Programming in Fortran 90 and 95. Prentice-Hall of India Pvt. Ltd (PHI).
2. Brainerd W. S. 2015, Guide to Fortran 2008 Programming. Springer-Verlag, London.
3. Chivers I. and Sleightholme J. 2015, Introduction to Programming with Fortran (With Coverage of Fortran 90, 95, 2003, 2008 and 77). Springer, Cham.
4. Kanetkar Y. P. 2016, Let us C. BPB publications. Brief overview of C language.

ES 1105	APPLIED GEOMORPHOLOGY AND QUATERNARY GEOLOGY		L	T	S	C
			3	0	3	4.5
Designation	Compulsory	Course type	Theory + Lab			
Pre-requisites	--	Contact hours:	78			
Department	Earth and Environmental Studies					

Course Content

Unit I: (12 Hours)

Introduction to earth surface processes and historical development in concepts; terrestrial relief, scales in geomorphology; Dynamics of geomorphology, energy flow and relative energy of surface processes; Climatogenetic geomorphology; Weathering and formation of soils, karst and speleology, slope and catchment erosion processes, fluvial, eolian, glacial, periglacial and coastal processes and resultant landforms; Water and sediment flux in river systems; geomorphic processes and resulting landforms geomorphic features of Indian sub continents; Geomorphological mapping based on genesis of landforms; morphometric analysis and modelling terrain evaluation for strategic purpose.

Unit II: (8 Hours)

Rates and changes in surface processes; Techniques for process measurement-sediment budgeting, rock magnetism, isotope geochemical tracers, cosmogenic nuclides, OSL & C-14 dating. Controlling factors (tectonics, climate, sea level changes and anthropogenic) and surface processes; Climate change and geomorphic response of fluvial systems of arid and humid regions; Geomorphic response to tectonics, sea level/base level change, anthropogenic affects.

Unit III: (10 Hours)

Definition, character and duration of Quaternary; Quaternary geomorphology; Quaternary time scale; Quaternary climate - Sea level changes, glacial/interglacial cycles, tectonics-climate coupling, sea floor spreading, BLAG hypothesis, Uplift-weathering hypothesis, carbon reservoir, vegetation dynamics, migration history, response of vegetation to climatic reversals; Quaternary Stratigraphy - oxygen isotope stratigraphy, biostratigraphy and magnetostratigraphy; Quaternary dating methods - Radiocarbon, Uranium series, Luminescence, Cosmogenic nuclides, Amino acid, Relative dating methods; Proxy indicators of paleoenvironmental/paleoclimatic changes; Quaternary Stratigraphy of India- continental records and marine records; Geoarchaeology; Introduction to Anthropocene, Meghalayan age.

Unit IV: (6 Hours)

Applied Geomorphologic mapping: Geomorphic classification systems, Role of geomorphic maps in different geo-scientific applications; Broad Geo-morphological setting of Indian Peninsula and surrounding; Isostasy and Climate-Tectonic interaction and feedback mechanism.

LABORATORY

(36 Hours)

Drainage and Slope Morphometry, Hypsometry, Preparation of geomorphic map, Preparation of longitudinal profile of a river, Calculating stream length gradient index, Morphometry of drainage basin, Interpretation of geomorphic processes from the geomorphology of the area; Geomorphic process identification and genetic landform mapping, Fluvial landform mapping, modelling and analysis; Glacier and snow cover mapping, snout point identification, glacial lake identification and mapping, glacial movement assessment; Tectonic landform mapping and analysis using aerial RS and high resolution multi-spectral images; Morphometric and geomorphic indices of active tectonics using DEM; Applied geo-morphological mapping using moderate resolution satellite data.

Essential Readings:

1. Bradley, F., *Paleoclimatology: Reconstructing Climates of the Quaternary*, Springer. Verlag 2000.
2. Maher and Thompson, *Quaternary Climates, Environments and Magnetism*, Cambridge University Press. 2000.
3. Williams, Durnkerley, Decker, Kershaw and Chhappell, *Quaternary Environments*, Wiley and Sons, 1998.
4. Selby, M.J (1985): *Earth's Changing Surface- An Introduction to Geomorphology*. Clarendon Press, Oxford. 607p.
5. Goswami, A.B. (2010): *Principles of Quaternary Geology and Environment Study- Concept, Methodology and Technique*. Books Way, Kolkata. 157p.
6. Van Zuidam, A. Robert (1985): *Aerial Photo- Interpretation in Terrain Analysis And Geomorphologic Mapping*. ITC. Smit Publishers, The Hague, The Netherlands. 422p

Supplementary Readings

1. William F. Ruddiman, *Earth's Climate: Past and future*, W. H. Freeman & Co Ltd., 1st edition, 2001.

ES2101	NATURAL HAZARD AND DISASTER MANAGEMENT	L	T	S	C
		2	0	0	2
Designation	Compulsory	Course type	Theory		
Pre-requisites	--	Contact hours:	28		
Department	Earth and Environmental Studies				

Course Content

Unit I: (7 Hours)

Introduction to Disasters: Definition: Disaster, Hazard, Vulnerability, Resilience, Risks– Disasters: Types of disasters anthropogenic and natural: Earthquake, Landslide, Flood, Drought, Forest Fire, etc–Classification, Causes, Impacts including social, economic, political, environmental, health, psychosocial, etc.- Differential impacts- in terms of caste, class, gender, age, location, disability – Global trends in disasters: urban disasters, pandemics, complex emergencies, Climate change- Dos and Don'ts during various types of Disasters.

Unit II: (7 Hours)

Approaches to Disaster Risk Reduction (DRR): Disaster cycle – Phases, Culture of safety, prevention, mitigation and preparedness community based DRR, Structural- nonstructural measures, Roles and responsibilities of- community , Panchayati Raj Institutions/Urban Local Bodies (PRIs/ULBs), States, Centre, and other stakeholders- Institutional Processes/ capacity building and Framework at State and National Levels- State Disaster Management Authority(SDMA)/ NDMA – Early Warning System – Advisories from Appropriate Agencies.–

Unit III: (7 Hours)

Disaster Risk Management in India: Hazard and Vulnerability profile of India, Components of Disaster Relief: Water, Food, Sanitation, Shelter, Health, Waste Management, Institutional arrangements (Mitigation, Response and Preparedness, Disaster Management Act and Policy, Coastal Regulation Zone – Other related policies, plans, programmes and legislation.

Unit IV: (5 Hours)

Applications And Case Studies: Landslide Hazard Zonation, Earthquake Vulnerability Assessment of Buildings and Infrastructure, Drought Assessment, Cyclone and Tsunamis; Floods: Fluvial and Pluvial Flooding; Forest Fire, Man Made disasters, Space Based Inputs for Disaster Mitigation and Management and field works related to disaster management.

Unit V: (2 Hours)

Role of GIS and Information Technology Components in Preparedness, Risk Assessment, Response, Recovery and Rehabilitation Phases of Disaster – Disaster Damage Assessment.

Essential Reading:

1. Singhal J.P. "Disaster Management", Laxmi Publications, 2010. ISBN-10: 9380386427 ISBN-13: 978-9380386423
2. Tushar Bhattacharya, "Disaster Science and Management", McGraw Hill India Education Pvt. Ltd., 2012.
3. ISRO publications on "Effective use of Space Technology in Disaster Mitigation and Management", 2000-2018.

Supplementary Reading:

1. Gupta Anil K, Sreeja S. Nair. Environmental Knowledge for Disaster Risk Management, NIDM, New Delhi, 2011
2. Kapur Anu Vulnerable India: A Geographical Study of Disasters, IIAS and Sage Publishers, New Delhi, 2010.

ES2102	IGNEOUS PETROLOGY		L	T	S	C
			2	0	3	3.5
Designation	Compulsory	Course type	Theory + Lab			
Pre-requisites	--	Contact hours:	60			
Department	Earth and Environmental Studies					

Course Content

Unit I: (12 Hours)

Phase rule, Selected Binary and Ternary phase diagrams; Chemical Petrology, its application to igneous petrogenesis: Major and minor elements and trace elements and isotopes, trace element modelling; Generation of basaltic magmas: Petrology of the mantle and mantle heterogeneity. Melting of the mantle and generation of primary magmas.

Unit II: (13 Hours)

Controls on magma segregation. Diversification of magmas – physical and chemical attributes of partial melting, magmatic differentiation, magma mixing, assimilation and mixed processes. Large Igneous Provinces. Magma generation with respect to Plate Tectonic setting.

LABORATORY (35 Hours)

Calculation of norms, Study of igneous rock textures; Petrographic study of common igneous rocks, Application of phase diagrams in determining the liquid line of descent; Numerical problems related to partial melting and Fractional crystallization.

Essential Reading:

1. Myron G. Best, *Igneous and Metamorphic Petrology*, Wiley-Blackwell; 2nd edition, 2002.
2. John D. Winter, *Principles of Igneous and Metamorphic Petrology*, Prentice Hall; 2nd edition, 2009.
3. Anthony Philpotts, Jay Ague, *Principles of Igneous and Metamorphic Petrology*, Cambridge University Press; 2nd edition, 2009.

Supplementary Reading:

1. Powell, R., *Equilibrium thermodynamics in Petrology: An Introduction*, Harper and Row Publ., London, 1978.

ES2103	METAMORPHIC PETROLOGY		L	T	S	C
			2	0	3	3.5
Designation	Compulsory	Course type	Theory + Lab			
Pre-requisites	--	Contact hours:	60			
Department	Earth and Environmental Studies					

Unit I: (10 Hours)

Metamorphism: A plate tectonic overview. Heat flow, geotherms and thermal models. Variance of metamorphic paragenesis. Thermodynamics of homogeneous and heterogeneous systems. Characterization of intensive and extensive variables through modeling of metamorphic reactions. Metamorphic mineral nucleation and crystal growth.

Unit II: (16 Hours)

Construction of petrogenetic grids. Progressive metamorphism of calcareous, pelitic and mafic rocks. Compositional zoning, Geothermobarometry and metamorphic P-T-t paths.

LABORATORY (34 Hours)

Identification of common metamorphic minerals; interpretation of metamorphic textures in relation to fabric elements; Construction of ACF and AFM diagram from chemical and mineralogical data.

Essential Reading:

4. Myron G. Best, *Igneous and Metamorphic Petrology*, Wiley-Blackwell; 2nd edition, 2002.
5. John D. Winter, *Principles of Igneous and Metamorphic Petrology*, Prentice Hall; 2nd edition, 2009.
6. Anthony Philpotts, Jay Ague, *Principles of Igneous and Metamorphic Petrology*, Cambridge University Press; 2nd edition, 2009.

Supplementary Reading:

2. Anthony Hall, *Igneous Petrology*, Longman Sci. & Tech, 1987.
3. Powell, R., *Equilibrium thermodynamics in Petrology: An Introduction*, Harper and Row Publ., London, 1978.

ES2104	GEOINFORMATICS IN GEOSCIENCES		L	T	S	C
			3	0	3	4.5
Designation	Compulsory	Course type	Theory + Lab			
Pre-requisites	--	Contact hours:	78			
Department	Earth and Environmental Studies					

Course Content

Unit I: (8 Hours)

Digital Image Processing (DIP) for Geological Applications: Geometric and basic atmospheric correction, Digital enhancement and visualization, image transformation (band arithmetic, indices, Principal Component Analysis, De-Correlation stretching), Spatial filtering, Image classification and information extraction for geological applications. Image segmentation, textural analysis, Morphological image processing, FFT, and wavelength transformation for geological applications.

Unit II: (8 Hours)

Geo-database creation, Geospatial analysis and output generation: Creation of geological database in GIS, data structure and data organization, data conversion, logical and mathematical operations, basic data integration, spatial analysis and map composition/layout preparation.

Digital Terrain Modelling (DEM): Generation of DEM, integration and composition of DEM from different sources, derivation of terrain components for geological applications, preparation of shaded relief and anaglyph images.

Unit III: (6 Hours)

RS for Geo-Scientific applications: Principles of RS data interpretation in Geology, RS image interpretation for Lithological Mapping, Structural Feature Identification and Analysis; Thermal RS for geological applications and earthquakes studies; volcano monitoring; microwave RS for Geological applications.

Unit IV: (6 Hours)

RS for Mineral Exploration: Surface indicators of Mineral Exploration; Spectroscopy of rocks and Minerals; Multi-spectral and Hyper-spectral RS for Mineral Exploration; Geochemical Anomaly mapping; Geophysical methods of exploration and integration with S; Minerals exploration modelling and Data integration, Exploration of radioactive minerals.

Unit V: (5 Hours)

RS for Hydrocarbon Exploration: Types of hydrocarbon resources; Mode of occurrence and surface indicators; RS for mapping geological & geo-morphological anomalies related to petroleum occurrence's; Exploration of shallow Gas, Gas Hydrates, ad Coal Bed Methane (CBM).

Unit VI:**(5 Hours)**

Planetary Geology: Overview of Planetary Missions; RS of Planetary surfaces; Major processes affecting planetary surfaces; Lunar Geology: observations from previous recent missions; Chyandrayaan-1: Mission objectives and fulfilment of aspirations; Chandrayaan-2: Mission objectives.

LABORATORY**(38 Hours)**

End to end data processing for geological and geo-morphological mapping and terrain analysis; DEM generation using DGPS survey and satellite stereo pair, DEM integration and comparison. Identification and interpretation of Igneous, metamorphic and sedimentary rocks types; Detection, identification and analysis of structural elements (viz., bedding, folds, faults, joints, faults, unconformities); Interpretation of thermal imagery for lithological and geo-environmental applications; Interpretation of microwave data and its comparison with optical RS data; Spectral analysis of rocks and minerals; GIS and RS based case examples for minerals and oil exploration.

Essential Reading:

1. J. George, *Fundamentals of Remote Sensing*; University Press (India) Pvt. Ltd., Hyderabad, India, 2005.
2. J. B. Campbell, *Introduction to Remote Sensing*, Guilford Press, 2002.
3. Liffie, Jonathan and Lott, Roiger (2008): Datum and Map Projections: For Remote sensing and GIS Surveying. 2nd ed.: CRC Press, 2008
4. Sanjib K. Ghosh (2005): Fundamentals of Computation Photogrammetry. Concept Publishing, New Delhi.

Supplementary Reading:

1. Longley, Paul A, Goodchild, Michael F., Maguire, David J., and David W. Rhind. (2005) Geographic Information Systems and Science, 2nd ed., John Wiley and Sons, Toronto.
2. M. T. Lillesand, W. K. Ralph, J. Chipman, *Remote Sensing and Image Interpretation*, 6th Edition, John Wiley, 2008.

ES3101	HYDROGEOLOGY		L	T	S	C
			2	0	4	4
Designation	Compulsory	Course type	Theory + Lab			
Pre-requisites	--	Contact hours:	72			
Department	Earth and Environmental Studies					

Course Content

Unit I: (7 Hours)

Hydro geochemical principles and Chemical evolution of natural ground water; Chemical Constituents of groundwater; Chemical equilibrium; mineral dissolution and solubility; REDOX process; Ion exchange and adsorption; Hydrochemical sequence and facies; groundwater in crystalline rocks, carbonate rocks and in sedimentary systems.

Unit II: (7 Hours)

Quantitative Assessment of groundwater resources; Exploration techniques surface and subsurface geological and geo physical method; well hydraulics; measurement of parameters; basin yield ;land subsidence; seawater intrusion .

Unit III: (7 Hours)

Groundwater Flow transport and contamination; Flow in saturated and vadose zone, dating of groundwater retardation, diffusion, dispersion, sources of Contamination Hydrochemical behaviour of contaminants groundwater modelling.

Unit IV: (5 Hours)

Application of RS & GIS in hydrogeology: Hydrological properties of different rocks, structure, land forms palaeochannels and their detection from remotely sensed data, hydrogeological provinces in India groundwater targeting in different geologic terrains using EO data and GIS techniques, run off estimation , quantification of groundwater resources; groundwater quality and pollution assessment, sea-water intrusion and land subsidence due to groundwater withdrawal.

LABORATORY (35 Hours)

Porosity and Permeability test (Falling bed); Pumping test; Analysis of groundwater quality; satellite image interpretation and analysis for groundwater prospects; groundwater prospect zonation using GIS; groundwater flow modelling using open source/proprietary software.

Essential Reading:

1. D. K. Todd, L. W. Mays, *Groundwater Hydrogeology*, John Wiley & Sons, 3rd Edition, 2005
2. O. M. Phillips, *Geological Fluid Dynamics Su-surface Flow and Reactions*, Cambridge University Press, 2009

3. K. R. Karanth, *Ground Water Assessment, Development and Management*, Tata Mc Graw Hill, 1987.
4. G. de Marsily, *Quantitative Hydrogeology: Groundwater Hydrology for Engineers*, Academic Press, 1986.
5. A.M.J.Meijerink et.al. (1994): *Introduction to the use of Geographic Information Systems for Practical Hydrology*. International Institute of Aerospace Survey and Earth Sciences (ITC), The Netherlands. Pub. No.23. p.243.

Supplementary Reading:

1. C. A. J. Appelo, D. Postma, *Geochemistry, Groundwater and Pollution*, A. A. Balkema, 2005.
2. F. H. Chapelle, F. Chapelle, *Ground-water Microbiology and Geochemistry*, John Wiley & Sons, 2001.
3. K. Subramanya, *Engineering Hydrology*, 3rd Edition, Tata Mc Graw Hill Pvt Limited, 2008

ES3102	FUEL GEOLOGY			L	T	S	C
				3	0	3	4.5
Designation	Compulsory	Course type	Theory				
Pre-requisites	--	Contact hours:	78				
Department	Earth and Environmental Studies						

Course Content

Unit I: (12 Hours)

Coal Geology: Origin of coal; macroscopic and microscopic constituents Concept and classification of 'Lithotype', 'Maceral' and 'Microlithotype; Classification of coal in terms of Rank, Grade and Type; Classification for coking and non-coking coals;

Definition and origin of coal; Sedimentology of coal bearing strata types of seam discontinuities and structures associated with coal seams; Physical and Chemical characteristics of coal; Biochemical and dynamochemical changes in coal formation; distribution of coal in space and time with special reference to India; clean coal technology.

Unit II: (12 Hours)

Petroleum Geology: Petroleum, its composition, Origin (Formation of source rocks-kerogen, organic maturation and thermal cracking of kerogen), and migration of petroleum; Reservoir rocks-porosity and permeability; Reservoir traps: structural, stratigraphic and combination traps; Oil field fluids: water, oil and gas; Onshore and offshore petroliferous basins of India. Oil-shale and shale-oil.

Unit III: (12 Hours)

Coalbed methane (CBM) – a new energy resource; Present status of CBM; Elementary idea about formation, properties, and generation of CBM; coal as a reservoir and CBM exploration; Hydro-fracturing of coal seams; Overview of drilling and production systems of CBM wells.

Nature, origin and distribution of Shale Gas/Oil; characterization of shale for production of Shale Gas/Oil; extraction methods of Shale gas/Oil; development of current practices; environmental issues in shale gas exploration.

Essential Reading:

1. L. D Thomas, *Coal Geology*, Wiley-Blackwell; 2nd Edition, 2012.
2. D. Chandra, R.M. Singh, M. P. Singh, *Textbook of Coal (Indian context)*, Tara Book Agency, Varanasi, 2000.
3. R.C. Selley, *Elements of Petroleum Geology*, Academic Press, USA, 1997.
4. Titayeva, *Nuclear Geochemistry*, CRC Press, 1994.

Supplementary Reading:

1. R.E Chapman, *Petroleum Geology*, Elsevier Science Publishers 1983.

2. G.D. Holson and E.N. Tiratso, *Introduction of Petroleum Geology*, Fulf Publishing, Houston, Texas, 1985.
3. K. Bjørlykke, *Petroleum Geoscience: From Sedimentary Environments to Rock Physics*, Springer, 2010.
4. A.C. Scott, *Coal and Coal-bearing strata: Recent Advances*, The geological Society of London, Publication no; 32, Blackwell scientific Publications, 1987.

ES3103	ORE GEOLOGY		L	T	S	C
			2	0	3	3.5
Designation	Compulsory	Course type	Theory + Lab			
Pre-requisites	--	Contact hours:	60			
Department	Earth and Environmental Studies					

Course Content

Unit I: (12 Hours)

Ore forming processes; Metallogeny and crustal evolution - spatial-temporal distribution of ore deposits; Study of ores in all possible scales of observation; phase equilibria in common ore bearing systems.

Unit II: (14 Hours)

Ores in mafic and ultramafic rocks: Chromite Ores, Ni-Cu-sulphide (+PGE) and Fe-Ti oxide deposits; Ores in felsic rocks: Porphyry Cu-Mo, Sn-W, skarns and near-surface epithermal Au-Ag-(Cu) deposits; Sources of ore fluid and metals through fluid inclusions and stable isotopes;

LABORATORY (35 Hours)

Megascopic study of Indian metallic ores and industrial minerals in hand specimens; Study of optical properties and identification of important ore minerals under ore-microscope; Ore texture and paragenesis

Essential Reading:

1. L. Robb, *Introduction to Ore-forming processes*, Blackwell Publishing, Oxford, 2005.
2. J. Ridley, *Ore Deposit Geology*, 1st edition, Cambridge university press, 2013.
3. A.M. Evans, *Ore Geology and Industrial Minerals: An Introduction*, 3rd Edition, Blackwell Publishing, Oxford, 1993.
4. A. Mookherjee, *Ore genesis—A holistic approach*, Allied Publisher, New Delhi, 1999.
5. M. Deb and S. C. Sarkar, *Minerals and Allied Natural Resources and their Sustainable Development – Principles, Perspectives with emphasis on the Indian scenario*, Springer, 2017.

Supplementary Reading:

1. J.R. Craig, D.J. Vaughan, *Ore Microscopy and Ore Petrography*, Wiley-Blackwell, 2nd Edition, 1994.
2. B. Pracejus *The Ore Minerals Under the Microscope*, Volume 3: An Optical Guide (Atlases in Geoscience) 2nd Edition 2015.
3. W. Pohl, *Economic Geology: Principles and Practice*, Wiley-Blackwell 1st Edition 2011.

ES 3104	ENGINEERING GEOLOGY		L	T	S	C
			3	0	3	4.5
Designation	Compulsory	Course type	Theory + Lab			
Pre-requisites	--	Contact hours:	78			
Department	Earth and Environmental Studies					

Course Content

Unit I: (10 Hours)

Civil Engineering Projects, geology and ground model: Project Management, Design of structures, design codes, Application of engineering geological principles; Concept of modelling, Geological reference models; Geological structures, Weathering, Geological hazards, Ground model for Engineering projects, Engineering properties of rocks, Geo-mechanical classification of rock mass, Rock Quality designation (RQD), Rock structure Rating (RSR) , Rock Mass Rating (RMR), Tunnelling Quality Index(TQI); Slope mass rating (SMR), 3D logging and drill core logging.

Unit II: (10 Hours)

Site investigation Analysis, Design and construction: Planning of ground investigation considering geological factors, environmental factors and construction related factors with reference to dam and Reservoir, Tunnel, Bridge foundation, building foundation, mass movement, slope stability problems-prediction and optimum design of slope including benches in mines and mine dumps ; seismic influence and earthquake resistive design; Criteria for selection of suitable dam, powerhouse and its appurtenant structures, Dam foundation mapping, delineation of adverse geological features, treatment and support measures; a few case studies related to geological problems.

Unit III: (6 Hours)

Roll of groundwater in engineering geology: Pore pressure, landslides and slope stability, influence of groundwater to dam and reservoir, inflow of groundwater into tunnel, inflow of groundwater into excavation.

Unit IV: (12 Hours)

Application of RS and GIS in engineering geology: RS based study of dam/ reservoir site selection in deferent geological setting, EIA of dam and reservoir, reservoir rim area, monitoring, land uses / land cover change analysis, analysis of impact of drawdown reservoir induced landslide assessment, RS application for mapping and monitoring of landslides, landslide hazard and risks modelling, mitigation and management.

LABORATORY (39 Hours)

Liquid limit, plastic limit, density and bulk density of soil; optimum moisture content and dry density of soil; Engineering geological mapping using different type of Remote Sensing data; Exercise on rock properties and strength/failure behaviour of rocks; landslide hazard zonation and risk analysis using RS and GIS; suitable site selection of dam/reservoir, catchment and

rim area analysis; route alignment between two points and discharge calculation at bridge site using RS and GIS; grain size, cohesion and friction angle (c & ϕ); kinematic analysis for slope

Essential Reading:

1. F.G. Bell, *Engineering Geology*, Butterworth-Heinemann; 2nd edition, 2007.
2. Tony Waltham, *Foundations of Engineering Geology*, CRC Press; 3rd edition, 2009.
3. David George Price, Michaelde Freitas, *Engineering Geology: Principles and Practice*, Springer, 2010.

Supplementary Reading:

1. J. Jaeger, N. G. Cook and R. Zimmerman, *Fundamentals of Rock Mechanics*, Wiley-Blackwell; 4th edition, 2007.
2. R. E. Goodman, *Introduction to rock mechanics*, Wiley, 2nd edition, 1989.

ES3105	SEDIMENTOLOGY			L	T	S	C
				2	0	3	3.5
Designation	Compulsory	Course type	Theory				
Pre-requisites	--	Contact hours:	72				
Department	Earth and Environmental Studies						

Course Content

Unit I: (11 Hours)

Sedimentary basin; Mechanics of basin formation and classification; Tectonics and sedimentation; Extrabasinal and intra basinal factors in sedimentation patterns; Terrigenous sediments; Petrography- depositional and diagenetic signatures, paleoclimatic and tectonic implications; Chemical Index of Alteration and its paleoclimatic implications. Carbonate sediments – Major controls on carbonate sedimentation, carbonate depositional systems, and carbonate geochemistry.

Unit II: (12 Hours)

Depositional system analysis: basic concept, architectural elements, bounding surface hierarchy, facies modelling, cyclic sedimentation: stratigraphic cycles and controlling factors

Unit III: (4 Hours)

Sequence stratigraphy : principles and applications

Laboratory

Petrographic interpretation, litholog correlation, fence diagram, preparation of isopach maps,

Essential Reading:

1. D.R. Prothero, F. Schwab, *Sedimentary Geology*, W.H. Freeman, 2nd Edition, 2003.
2. G. Nichols, *Sedimentology and Stratigraphy*, Wiley-Blackwell, 2nd Edition, 2012.
3. M. Tucker, *Sedimentary Petrology*, Wiley-Blackwell, 3rd edition, 2001.
4. S. M Sengupta, *Introduction to Sedimentology*, CBS Publications, 2nd Edition, 2007.
5. H.G. Reading, *Sedimentary Environments: Process, Facies and Stratigraphy*, Wiley-Blackwell, 3rd edition, 1996.
6. Allen, P A and J R L Allen : Basin analysis, Blackwel, 2nd edition 2005

Supplementary Reading:

1. S. Boggs, *Principles of Sedimentology and Stratigraphy*, Pearson Education India 5th Edition, 2016.
2. R.C. Selley, *Applied sedimentology*, Academic Press, 2nd edition, 2000.
3. J. Collinson, N. Mountney, D. Thompson, *Sedimentary Structures*, Terra Publishing, 3rd edition, 2006

ES 4101	ENVIRONMENTAL GEOLOGY		L	T	S	C
			3	0	0	3
Designation	Compulsory	Course type	Theory			
Pre-requisites	--	Contact hours:	42			
Department	Earth and Environmental Studies					

Course Content

Unit I: (12 Hours)

Ecosystem and mutual interaction among environment segment (atmosphere, lithosphere, hydrosphere and biosphere); Indicators of climate change and impact of climate change in earth system with geologic time; impact of atmospheric and oceanic circulation on climate and agriculture; Cainozoic climate extremes, evolution of life, especially the impact on human evolution; CO₂ in atmosphere, ocean and geologic sequences, records of palaeotemperature in ice cores of glaciers, correlation between atmosphere CO₂ content and palaeotemperature. Present day Global warming mechanism natural and anthropogenic causes and effects.

Unit II: (12 Hours)

Impact assessment of depletion and contamination of surface water and groundwater due to industrialisation, urbanisation mining and agriculture, soil profile and soil quality degradation due to industrialisation, urbanisation, agriculture and mining ;Role of geological in waste disposal, basic of Environmental law, EIA and EMP.

UNIT III: (10 Hours)

Distribution, magnitude and intensity of earthquake, Influence of neotectonics in seismic hazard assessment; Environmental effect of volcano; landslides, cyclone and major floods; deforestation and desertification.

Unit IV: (5 Hours)

RS & GIS: Thermal Remote Sensing for Geological application viz. Volcano monitoring, coal fire hazard; Mining and environment, Land degradation and desertification, Integrated coastal zone management

Essential Reading:

1. Carla Montgomery, *Environmental Geology*, McGraw-Hill Science/Engineering/Math; 9th edition, 2010.
2. Edward A. Keller, *Environmental Geology*, Prentice Hall; 9th edition, 2010.

Supplementary Reading:

1. Daniel B. Botkin, *Environmental Science Earth as a Living Planet*, Wiley; 8th edition. 2009.

ELECTIVE COURSES

ES 9101	GEODYNAMICS		L	T	S	C
			3	0	0	3
Designation	Elective I	Course type	Theory			
Pre-requisites	--	Contact hours:	42			
Department	Earth and Environmental Studies					

Course Content

Unit I: (20 Hours)

Concept of Tectonics. Continental drift and the origin of Plate Tectonic theory. Tectonics on a sphere. Palaeomagnetism and past plate motions, with emphasis on the history of modern oceans. Components of the oceanic lithosphere - ridges, transform faults, trenches and oceanic islands. The continental lithosphere – cratons, sedimentary basins, continental margins and rift zones. Collisions – characteristics of arc-arc, arc-continent and continent-continent collision zones. Anatomy of orogenic belts – foreland basins, foreland fold-and-thrust belts and Crystalline Core Zones. Origin of mantle discontinuities and implications for mantle convection models. Evidence for single and double-layered mantle convection. Granite tectonics – emplacement mechanisms of granitic plutons, regional tectonics and its influence on fabric development in granites, concept of percolation theory, rheological properties of granite with changing crystal-melt fraction and evolution of fabrics.

Unit II: (20 Hours)

Geodynamics - application of basic geophysical theory to interpretation of geologic phenomena. Heat flow and geothermics – calculation of equilibrium and evolving geotherms. Plate cooling models - relationship between surface heat flow and bathymetric depth. Driving forces for plate motions. Mantle geotherms and adiabats. Elasticity and flexure, and application to the earth's lithosphere. Origin and models of various types of sedimentary basins – basins of thermal origin, flexural basins, extensional basins and compressional basins.

Essential Reading:

1. Kent C. Condie, *Earth as an Evolving Planetary System*, Academic Press; 2nd edition, Second Edition, 2010.
2. J. S. Brian, W.M. Barbara, *The Blue Planet: An Introduction to Earth System Science*, 3rd Edition, Wiley, 2010.
3. Edward J. Tarbuck, Frederick K. Lutgens, Dennis G. Tasa, *Earth: An Introduction to Physical Geology*, Pearson 12th edition, 2016.

Supplementary Reading:

1. William Lowrie, *Fundamental of Geophysics*, Cambridge University Press, 2nd edition, 2007.
2. Charles Fletcher, *Physical Geology: The Science of Earth*, John Wiley & Sons, 2nd Edition, 2010.

ES 9102	APPLIED GEOCHEMISTRY		L	T	S	C
			3	0	0	3
Designation	Elective I	Course type	Theory			
Pre-requisites	--	Contact hours:	42			
Department	Earth and Environmental Studies					

Course Content

Stellar evolution and the origin of elements; the origin and evolution of meteorites with implications for homogeneous versus heterogeneous accretionary models of planet formation. Structure and composition of earth and distribution of elements. Element fractionation in magmatic and metamorphic systems. Introduction to isotope geochemistry with implications for the crust-mantle couple. Geochemistry of natural waters, and low temperature aqueous geochemistry. Chemistry of the oceans.

Essential Reading:

1. K. B. Krauskopf, D. K. Bird, *Introduction to Geochemistry*, McGraw-Hill, 1995.
2. C.A.J. Appelo, D. Postma, *Geochemistry, Groundwater and Pollution*, Taylor & Francis; 2nd edition, 2005.
3. J. V. Walther, *Essentials of Geochemistry*, Jones and Bartlett, 2010
4. P. Henderson, *Inorganic Geochemistry*, Oxford Pergamon Press, 1982.

Supplementary Reading:

1. J. I. Drever, *The Geochemistry of Natural Waters*, Prentice Hall, 1997
2. H. McSween, S. M. Richardson and M. E. Uhle, *Geochemistry: Pathways and Processes*, Overseas Press, 2006.

ES 9103	ISOTOPE GEOLOGY AND GEOCHRONOLOGY		L	T	S	C
			3	0	0	3
Designation	Elective I	Course type	Theory			
Pre-requisites	--	Contact hours:	42			
Department	Earth and Environmental Studies					

Course Content

Unit I: (20 Hours)

Mass spectrometry: principles and applications; Fission track dating; Stable isotopes of oxygen, hydrogen, carbon and sulphur; Fractionation of stable isotopes; Stable isotope geothermometry; Analytical methods in stable isotopes; Applications of isotopes in petrogenesis, mineral-petroleum exploration, paleo-climate and environmental studies.

Unit II: (20 Hours)

Nuclear systematics; Decay mechanisms of radionuclides atoms; Radioactive Decay and radiogenic growth, Geochronometry; Isotope systematics of Rb-Sr, K-Ar Sm-Nd, U-Th-Pb Re-Os in igneous, metamorphic, sedimentary and ores and in evolution of ocean crust and mantle.

Essential Reading:

1. G. Faure, T. M. Mensing, *Isotopes: Principles and Applications*, Wiley; 3rd Edition, 2009.
2. A. Dickin, *Radiogenic Isotope Geology*, Cambridge University Press. 2nd Edition 2005.
3. C. J. Allègre, *Isotope Geology*, Cambridge University Press, 2008.
4. Z. Sharp, *Principles of Stable Isotope Geochemistry*, Prentice Hall; 1st Edition, 2006.

Supplementary Reading:

1. Hoefs, J., *Stable Isotope Geochemistry*, 3rd Edn. Springer-Verlag, 1987.
2. Geyh, M. A. and Schleicher, H., *Absolute age determination*, Springer, 1990.
3. JW Valley, D.R. Cole, *Stable Isotope Geochemistry* (Reviews in Mineralogy and Geochemistry, Volume 43)-Mineralogical Society of America, 2001.

ES 9104	PALEOCLIMATOLOGY		L	T	S	C
			3	0	0	3
Designation	Elective I	Course type	Theory			
Pre-requisites	--	Contact hours:	42			
Department	Earth and Environmental Studies					

Course Content

Introduction to changing climate with respect to stratigraphy; Global climate pattern; Climate controlling factors; Global energy budget; Plate tectonics and climate change; Milankovitch cycles; Atmosphere and Ocean interaction and its effect on climate; An Overview of Paleoclimatic reconstruction; Major events in earth's climatic history - Snowball earth, Cretaceous hothouse, Cenozoic climate, Pleistocene glaciations, Last Glacial Maximum and the Holocene; Pleistocene Glacial-Interglacial cycles; Geological records of climate change - Sedimentology, stable isotopes, geochemistry, geochronology – relative and numerical methods; Pre-Quaternary climates, evolution of climate through geological time; Future Climate- Anthropogenic activity and its effect on Global climate.

Essential Readings:

1. Bradley, F., *Paleoclimatology: Reconstructing Climates of the Quaternary*, Springer. Verlag 2000.
2. T.J. Crowley and G.R. North, *Paleoclimatology*, Oxford University Press, 1991.

Supplementary Readings

1. William F. Ruddiman, *Earth's Climate: Past and future*, W. H. Freeman & Co Ltd., 1st edition, 2001.

ES 9105	EXPLORATION GEOPHYSICS			L	T	S	C
				3	0	0	3
Designation	Elective II	Course type	Theory				
Pre-requisites	--	Contact hours:	42				
Department	Earth and Environmental Studies						

Course Content

Fundamental concepts of Geophysics, Principle, interpretation and instrumentation of various geophysical methods; Gravity Method, Gravity corrections and anomalies, Magnetic and Electromagnetic Methods, Passive and exploration Seismology; Electrical Methods – Telluric current, Resistivity, Induced Polarization, Self-Potential method; Radioactive survey; Introduction to well logging.

Essential Reading:

1. W.M. Telford, L.P. Geldart, R.E. Sheriff, *Applied Geophysics*, Cambridge University Press, Second Edition.
2. Milton B. Dobrin and Carl H. Savit, *Introduction to Geophysical Prospecting*, 4th Edition, Mcgraw-Hill College; 4th sub-edition, 1998.
3. Philip Kearey, Michael Brooks, Ian Hill, *An Introduction to Geophysical Exploration (2002)*, Wiley-Blackwell; 3rd edition, 2003.
4. James K. Hallenborg, *Standard Methods of Geophysical Formation Evaluation*, CRC Press; 1st edition, 1997.

Supplementary Reading:

1. William Lowrie, *Fundamental of Geophysics*, Cambridge University Press, 2nd edition, 2007.

ES9106	APPLIED MICROPALAEONTOLOGY		L	T	S	C
			2	0	2	3
Designation	Elective II	Course type	Theory			
Pre-requisites	--	Contact hours:	60			
Department	Earth and Environmental Studies					

Course Content

Unit I:

(26 Hours)

Micropalaeontology:

Definition and scope of Micropalaeontology; Relationship of Micro palaeontology with Ocean Science Surface and Subsurface sampling methods including deep sea drilling (ODP, DSDP, IODP); Sampling Modern Ocean Biogenic Flux including Joint Global Ocean Flux Studies (JGOFS). Sample processing techniques. Equipments for micropalaeontological studies, Study of following groups of microfossils with reference to their outline of morphology, modern biogeography, application in paleoceanographic and paleoclimatic reconstruction and oceanic biostratigraphy with special reference to India. Calcareous microfossils including Foraminifera, Calcareous nannofossils. Ostracoda, pteropods, calpionellids and calcareous algae. Siliceous microfossils including Radiolaria, Diatoms, Silicoflagellates. Phosphatic microfossils including Conodonts. Organic Walled Microfossils including Acritarchs and Dianoflagellates, Pollens and Spores Applications of stable isotopic and elemental composition of various microfossils in paleoclimatic/paleoceanographic reconstruction. Organo-geochemical proxies for paleoclimatic /paleoceanographic studies Application of Micro pale ontology in Hydrocarbon Exploration.

LABORATORY

(30 Hours)

Techniques of separation of microfossils from matrix; Types of microfossils - calcareous, siliceous, phosphatic and organic walled microfossils; SEM applications in micropaleontology; Study of surface ultrastructures of foraminifera.

Essential Reading:

1. Anis Kumar Ray, *Fossils in Earth Sciences*, PHI Learning Private Limited, February 2014
2. Howard A. Armstrong & Martin D. Brasier, *Microfossils*, Blackwell Publishing, Second Edition 2005

Supplementary Reading:

1. Bilal-UI-Haq, Anne Boersoma, *Introduction to Marine Micropaleontology*, Elsevier Science, 1998.
2. Amal Dasgupta, *An Introduction to Palaeontology*, The World Press Private Limited Kolkata, 2012.

ES9107	MINERAL EXPLORATION		L	T	S	C
			3	0	0	3
Designation	Elective II	Course type	Theory			
Pre-requisites	--	Contact hours:	42			
Department	Earth and Environmental Studies					

Course Content

Importance of minerals to mankind; Value of minerals and their contribution to GNP; Minerals in times of peace and war; Intelligent use of minerals vis a vis industrial /economic growth; World production of minerals and International trade; Dwindling mineral resources and their impact on society; Mineral inventory; Planning for mineral prospecting and exploration; Infrastructure requirement for prospecting and exploration work; Work schedule for geological, geochemical and geophysical prospecting and exploration and their tentative costing; Case histories; Sampling techniques; Modern approaches ? genetic models and formulation of exploration criteria, empirical tools and target fixation; Application of Remote Sensing and GIS in mineral exploration; Mineral potential mapping using mathematical tools; Ore reserve calculations; Introduction to mining and beneficiation methods; Oil Exploration and Economics.

Essential Reading:

1. W.M. Telford, L.P. Geldart, R.E. Sheriff, *Applied Geophysics*, Cambridge University Press, Second Edition.
2. Milton B. Dobrin and Carl H. Savit, *Introduction to Geophysical Prospecting*, 4th Edition, Mcgraw-Hill College; 4th sub-edition, 1998.
3. Philip Kearey, Michael Brooks, Ian Hill, *An Introduction to Geophysical Exploration (2002)*, Wiley-Blackwell; 3rd edition, 2003.
4. James K. Hallenborg, *Standard Methods of Geophysical Formation Evaluation*, CRC Press; 1st edition, 1997.

Supplementary Reading:

1. William Lowrie, *Fundamental of Geophysics*, Cambridge University Press, 2nd edition, 2007.

ES 9108	GEOSTATISTICS			L	T	S	C
				3	0	0	3
Designation	Elective II	Course type	Theory				
Pre-requisites	--	Contact hours:	42				
Department	Earth and Environmental Studies						

Course Content

Unit I:

(42 Hours)

Elements of probability and different types of probability distribution functions, inductive statistics and hypothesis testing, sampling theory: application to Geological data analysis; Techniques of multivariate data analysis and reduction :factor analysis, principal component analysis and discriminate analysis and applications to Geological problems; Analysis of data in sequence ? time series analysis. Pattern recognition techniques: statistical, structural and Fractal, Neural Network approaches and application to geological problems. Principles of optimization: classical techniques, linear and quadratic programming and stochastic programming. Time series analysis and modeling, convolution, correlation, filtering. Finite element and finite difference techniques.

Essential Reading:

1. Schabenberger, O. and Gotway, C. (2005) Statistical Methods for Spatial Data Analysis Chapman & Hall/CRC.
2. Peter J. Diggle, Paulo J. Ribeiro, Jr (2007) Model-based geostatistics, Springer.
3. Cressie, N. (1993). Statistics for Spatial Data (Revised Ed.). John Wiley & Sons, Inc.
4. Chiles, J. P. and Delfiner, P. (1999) Geostatistics: Modeling Spatial Uncertainty. Wiley.

Supplementary Reading:

1. Stein, M. L. (1999) Interpolation of Spatial Data: Some Theory for Kriging. Springer.
2. Banerjee, S, Carlin, B., and Gelfand, A. E. (2004) Hierarchical modeling and analysis for spatial data. Chapman & Hall
3. Wackernagel, Hans (1998) Multivariate Geostatistics (2nd ed.) Springer.

ES 9109	HYDROCARBON EXPLORATION			L	T	S	C
				3	0	0	3
Designation	Elective III	Course type	Theory				
Pre-requisites	--	Contact hours:	42				
Department	Earth and Environmental Studies						

Course Content

Unit I:

(6 Hours)

Introduction to oil fields, flow of fluid through rocks, Petroleum reservoir types, characteristics, Performances and calculations. Genesis of hydrocarbon and migration into reservoir rock, reservoir rock properties (porosity and permeability), Hydrocarbon traps and seals, Oil sands and estimation of Oil and gas reserves, oil field water, formation evaluation, well logging, sedimentary environment and well log interpretation. Drilling for oil and gas exploratory and production drilling mud technology, drill bits. Drill rigs and structure, Off shoe drilling, directional drilling, Casing and cementation, well completion and stimulation. Petroleum production methods, traditional and artificial lift, sucker rod pumping systems and gas lifting, secondary and enhanced recovery, Crude transportation, pumping and pipeline components-operation and maintenance, International oil market and oil economics

Essential Reading:

1. Hydrocarbon Exploration and Production, 2nd Edition (2008): by Frank Jahn and Mark Cook.
2. Hydrocarbon: Exploration and Production (2015): by Allegra Smith.

Supplementary Reading:

1. S. A. Tedesco (1994): Surface Geochemistry in Petroleum Exploration, Springer-Verlag.
2. Hyne, N.J. (2001): Nontechnical Guide to Petroleum Geology, Exploration, Drilling and Production (2nd Ed.), Pennwell Co., Oklahoma.
3. Ian Lerche and James A. Mackay (1999): Economics Risks in Hydrocarbon Exploration, Pennwell Co.

ES 9110	OCEANOGRAPHY		L	T	S	C
			3	0	0	3
Designation	Elective III	Course type	Theory			
Pre-requisites	--	Contact hours:	42			
Department	Earth and Environmental Studies					

Course Content

Unit I: (10 Hours)

General introduction, major expeditions-Dimensions of the ocean, Geographical features of ocean – Physical properties of sea water-distribution of temperature, salinity, density and oxygen in space and time, mixed layer and barrier layer, Acoustic properties of sea water-sound velocity profile- SOFAR channel and shadow zone-Optical characteristics of sea water- Color of the sea. Heat budget of ocean: Radiation laws, insolation-long wave radiation-factors controlling short wave and long wave radiation- sensible and latent heat transfer, bulk formula for heat fluxes- Bowen's ratio- ocean heat transport- spatio-temporal variability of heat budget terms and net heat balance.

Unit II: (10 Hours)

Circulation and Water masses: General circulation of the atmosphere – wind driven currents in the world ocean – Equatorial current systems – Wyrтки Jet Under currents- Circulation in the Arabian Sea and Bay of Bengal- Somali current – wind stress Ekman spiral- Upwelling – Indian Ocean Dipole (IOD)- El Nino and La Nina. Formation and classification of water masses- T-S diagram-water masses of the world ocean- thermohaline circulation – Identification of water masses. Waves and Tides: General aspects of ocean waves, wave characteristics, sea and swell, deep and shallow water waves, storm surges and tsunamis-Tides and tide generating forces; their causes, variation and types, Tidal currents.

Unit III: (10 Hours)

Unit V: Marine geology: Continental shelf, Slope, Shelf sediments, mineral resources of the world ocean, submarine topography, mid oceanic ridge system. Manganese and other deposits and the factors controlling their distribution. Marine biology: Classification of marine environment, Bio geo chemical cycles. Influence of Physical parameters (Temperature, salinity, waves, currents, tides etc.). Mangroves

Unit IV: (10 Hours)

Ocean properties measurable from satellites Ocean Color Remote Sensing: optical theory for Ocean color remote sensing, recovering useful information from ocean color, estimating water parameters from spectral band ratios, identifying Potential Fishing Zones. IR measurement of Sea Surface Temperature – retrieving SST: IR Radiometer, AVHRR, ATSR, AIRS, Oceanographic application of IR SST data. Passive microwave Radiometers: Physical principle of passive microwave radiometry, retrieval of Salinity, SST and surface wind from microwave measurements.

Essential Reading:

1. Coastal ocean observing systems, Liu, Yonggang, Kerkering, Heather, Weisberg, Robert H., Elsevier, 2015.

2. Descriptive Physical Oceanography, Reddy, M. P. M., 2000, New Delhi Oxford & IBH
3. Descriptive Physical Oceanography, Emery, William J., 1982, Pergamon Press (Oxford)

Supplementary Reading:

1. Descriptive Physical Oceanography: An Introduction: G. L. Pickard and W. J. Emery, Pergamon, 5th Edn., 1992.
2. Descriptive Physical Oceanography: An Introduction. Ed.6, Lynne D. Talley, George L. Pickard, William J. Emery and James H. Swift, Elsevier, 2011.

ES 9111	CONTAMINANT HYDROGEOLOGY		L	T	S	C
			3	0	0	3
Designation	Elective III	Course type	Theory			
Pre-requisites	--	Contact hours:	42			
Department	Earth and Environmental Studies					

Course Content

Unit I: (6 Hours)

Groundwater Quality: Water quality standards, collection of groundwater samples, Field analysis and sample conversion, Accuracy of chemical analysis; Use of mass balance to assess water presentation of water quality data, Groundwater monitoring techniques.

Unit II: (6 Hours)

Groundwater contamination: Septic tanks and cesspools; Landfills; Chemical spill and leaking underground tank; agricultural activities; Industrial effluent outfall, Mining, Saline – water intrusion and other sources.

Unit III: (7 Hours)

Concepts and principles related to the movement of solutes in groundwater systems: Continuity equation and Ficks' law, mass transfer (adsorption, desorption, absorption, decay, dissolution and volatilization); mass transfer (advection, dispersion, and diffusive flux), solute transport in double-porosity media.

Unit IV: (8 Hours)

Transformation, Retardation, and Attenuation of Solutes: Linear and non-linear (Frendlich and Langmuir) isotherms, equilibrium and kinetic adsorption, Determination of adsorption coefficients, Determination of flow velocity and dispersivity coefficients, Hydrodynamics dispersion, longitudinal and lateral dispersivity.

Unit V: (6 Hours)

Groundwater Transport Modelling: Analytical solution of classical advection-dispersion equation, Finite different and finite element approach, Discussion of boundary conditions, steady state and transient model, Modelling framework for solute transport in saturated and unsaturated media, Introduction to modelling software in groundwater and contaminant transport modelling.

Unit V: (6 Hours)

Remediation Techniques: Pump-and treat, Permeable reactive barriers and their design, Soil vapour extraction, Air Stripping, Bioremediation and phytoremediation processes, wetland processes.

Essential Reading:

1. Geotechnical practice for waste disposal by D.E. Daniel
2. Applied Hydrogeology by C.W. Fetter
3. Hydrology by H.M Raghunath
4. Geoenvironment Engineering: Site remediation, waste contaminant and emerging waste management technologies by H.D. Sharma and K.R. Reddy

Supplementary Reading:

1. Environmental Engineering: A Design Approach by Sincero and Sincero
2. Groundwater by Freeze and Cherry
3. Applied contaminant transport modelling by C. Zheng and G.D. Bennet.

ES 9112	PRECAMBRIUM GEOLOGY		L	T	S	C
			3	0	0	3
Designation	Elective III	Course type	Theory			
Pre-requisites	--	Contact hours:	42			
Department	Earth and Environmental Studies					

Course Content

Unit I: (5 Hours)

Origin of the Earth – theories. Age of the Earth vs the age of the oldest rocks. Classification of the Precambrian according to the IUGS classification scheme.

Unit II: (5 Hours)

Major components of Archean geology – the origin of cratons. Geological evolution of cratons – granite-greenstone belts and gneiss domes.

Unit III: (10 Hours)

The Proterozoic – mobile belts and cratonic sedimentary provinces – significance for evolution of the continental crust.

Unit IV: (15 Hours)

Evolving magmatism, sedimentation and metamorphism through the Precambrian. Major geological events in the Precambrian – continental crust formation, cratonization, the great oxygenation event and the evolution of life. Importance of the Ediacaran faunal assemblage. Tectonics in the Precambrian – evidence for and against Plate Tectonics.

Unit V: (5 Hours)

Study of few major shield areas – Kaapvaal, Yilgarn and Superior Province. Precambrian of India and evolution of the Indian shield.

Essential Reading:

1. Ramakrishnan, M. & Vaidyanadhan, R. (2008) Geology of India Volumes 1, Geological society of India, Bangalore.
2. Valdiya, K. S. (2010) The making of India, Macmillan India Pvt. Ltd.
3. Nichols, G. (2009). Sedimentology and Stratigraphy Second Edition. Wiley Blackwell
4. Code of International Stratigraphy Commission.

Supplementary Reading:

1. Krishnan, M. S. (1982) Geology of India and Burma, CBS Publishers, Delhi 2.
2. Doyle, P. & Bennett, M. R. (1996) Unlocking the Stratigraphic Record. John Wiley.

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**NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR
DEPARTMENT OF BIOTECHNOLOGY**

To
The Director,
NIT Durgapur,

Date: Jan 11, 2020

Subject: Opening of the M.Sc. (Life Sciences) programme under DBT funding

Dear Sir,

Department of Biotechnology has already proposed to start a new programme of M.Sc. (Life Sciences), which has been recommended in principle by PGAC on October 24, 2019 and the matter has been referred to the Senate for its approval. In the meanwhile, Department of Biotechnology, Govt. of India has also advertised for such proposals to be submitted latest by Jan 20, 2020. So, we have prepared the application, with minor modifications in the already proposed curriculum as per the requirement of the funding agency to start the said programme. The proposal has been ratified in DAC meetings dated December 11, 2019 and January 09, 2020.

I would like to request you to kindly sign in the application so that we can submit the same to Department of Biotechnology, Govt. of India.

Enclosed please find the relevant documents for your kind perusal.

Your kind consideration of the matter will be highly appreciated.

Shl. 11/1/2020

Surabhi Chaudhuri
Head
Biotechnology Department

Advance application may be sent. To be ratified in next Senate
11/09/2020

Enclosures

1. Proposal
2. PGAC resolution dated 24.10.2019
3. DAC resolution dated 11.12.2019
4. DBT proposal notification



सत्यमेव जयते

**Department of Biotechnology
Ministry of Science and Technology
Government of India**

**CALL FOR PROPOSALS FOR STARTING POST GRADUATE TEACHING PROGRAMME
IN BIOTECHNOLOGY**

Department of Biotechnology is supporting Postgraduate Teaching Programme in multidisciplinary areas of Biotechnology since 1985-86 for imparting quality education in various areas of Biotechnology for generation of critical mass of trained manpower in the country.

Programme Purpose: The aim of this programme is to build strong skilled human resource in rapidly advancing areas, meeting with today's requirement. The Programme focuses on high standards of teaching, training and nurturing excellence in Biotechnology education for generating critical mass of trained manpower in multidisciplinary areas of Biotechnology required for novel, innovative and cutting edge R&D activities. Department has been supporting Postgraduate Teaching Programme since inception and we have come a long way in creating a critical mass of students who have played a major role in driving the various R&D activities across the country over these years. The Department of Biotechnology, Ministry of Science & Technology is soliciting fresh applications from Universities/institutes/organizations for starting Postgraduate Teaching Programme M.Sc./M.Tech. under DBT support in Life Sciences and Biotechnology covering broader areas of basic, agricultural, medical, veterinary, engineering and allied areas with focus on specialized and new/emerging areas of Biotechnology which need to be incorporated as electives and core courses for holistic development in the field of Biotechnology .

Who can apply?

Universities/Institutes/organizations having Biotechnology and other science departments can submit joint/ collaborative proposals for 2 years' postgraduate degree programme for M.Sc./M.Tech. in Biotechnology. Universities/institutes/Organizations having relevant infrastructure facilities and core expertise for starting new specialized programmes in new/emerging/niche areas or support for existing/ongoing programme in Biotechnology can also apply. All universities/institutes who are having ongoing support will also need to apply for fresh support.

How to apply?

Interested Universities/institutes/organizations can submit their proposal (5 hard copies and 1 soft copy) in the prescribed format available on DBT website to **Dr. Manoj Singh Rohilla, Scientist-'E'**, HRD Division, Department of Biotechnology, Ministry of Science & Technology, Block-2, Room No. 613, CGO Complex, Lodi Road, New Delhi-110 003. Kindly submit soft copy as a single word file only at: Email: manojrohilla.dbt@nic.in. Last Date of submission of proposals is 20th January, 2020. Please visit the DBT website www.dbtindia.nic.in for complete information about guidelines and format for submission of proposal.

**POFORMA FOR SUBMISSION OF PRO POSAL FOR POSTGRADUATE TEACHING
PROGRAM (M.SC./M.TECH.) IN BIOTECHNOLOGY**

UNDER HUMAN RESOURCE DEVELOPMENT PROGRAMME

5 copies, back-to-back print & soft cover page forwarded through the executive authority of
the University/institute/Organization should be sent to:

**Dr. Manoj Singh Rohilla
Scientist-'E'
HRD Division
Department of Biotechnology
Block 2, 6th Floor, Room No. 613
CGO Complex, Lodi Road
New Delhi-110003
Email: manojrohilla.dbt@nic.in**

1.	Name of the Institute/ University	:	National Institute of Technology Durgapur
2.	Name of the Degree	:	M.Sc. in Life Sciences
3.	Duration of the Course	:	2 years
4.	Objectives of the programme	:	<ol style="list-style-type: none">1. To impart advanced knowledge on diverse existing and emerging areas of Life Science and Biotechnology research and application.2. To exercise a course curriculum with sufficient time for research activities so that students are better prepared for the much needed R&D activities required in the country.3. To attract the brightest and the best students and provide them an excellent learning environment where they can question, think and analyze today's life science and biotechnology problems with open mind and independence.
5.	Number of seats per year (Minimum and Maximum)	:	15
6.	Justification for starting the Programme and requirement of DBT support	:	<ol style="list-style-type: none">1. A similar programme is only offered in IISER Kolkata in the region. The M. Sc. Life Sciences programme, which is proposed by NIT Durgapur will offer much needed basic and advanced

			<p>learning in the field of life sciences for the students of the region as well as the whole country.</p> <p>2. A survey of the many related programmes in the institutions of the region showed most of them are providing less than adequate time for training the students through research. Thus NIT Durgapur embarks in developing a Life Science programme which will provide significant time to students for their research activity.</p> <p>3. NIT Durgapur has successfully run B. Tech and M.Tech in Biotechnology programmes for past 16 and 12 years, respectively. While this has provided much needed expertise and knowhow to run such programme, it has provided understanding the gaps in those programmes. Through this programme such gaps may be covered.</p> <p>4. As the programme intend to engage students for a two semester long research projects, DBT funding will be highly helpful to provide relevant infrastructure and consumable for their research activity.</p> <p>5. DBT funding of the programme will create the opportunity for fellowship of the students which will help the institute to attract best students for the course.</p>
7.	Total Project cost of the Programme for 5 Years	:	345 Lakhs
8.	The major areas of Teaching/Training (in-house Dissertation).	:	<p>Biochemistry</p> <p>Microbiology</p> <p>Cell and Molecular Biology</p> <p>Immunology</p> <p>Plant Biotechnology and plant genetics</p> <p>Plant developmental biology</p> <p>Structural biology</p>

			Human genomics Meta genomics Bioinformatics Environmental Biotechnology Biofuel Nanobiotechnology Cancer biology Food biotechnology Biosensors
9.	Mode of selection of students	:	All India Combined Entrance Examination conducted by DBT
10.	Eligibility for admission of students	:	B. Sc. in any branch of Life Sciences/Chemistry/Physics
11.	Names of the Departments proposed to be collaborating in the Programme (The programme is envisaged to be collaborative, interdepartmental)	:	Biotechnology Physics Mathematics
12.	Name, designation, field of specialization of faculty members of participating departments in the institution and list of major publications in the last five years in the field of biotechnology.	:	Please see Annexure-A
13.	List of existing major equipments and infrastructure facilities including laboratory and class room space.	:	Please see Annexure-B
14.	Major Research grants received	:	Please see Annexure-C
15.	Facility for Students: (A) Hostel Facility (B) Placement Cell	:	(A) Hostel facility: Institute has 9 boys and 4 girls hostel which can accommodate more than 5000 students. (B) Placement Cell: Institute has a very active placement cell. In the year 2018-19 students from Biotechnology department have participated in 25 campus recruitment events of 25 recruiters from diverse fields and 28 students out of 68 eligible students have received campus recruitment. (C) Library facilities:

			<p>Campus has a central library facility which remains open till 12 o'clock midnight.</p> <p>(D) Central instrumentation facility (CIF) with sophisticated instruments like XRD and SEM with EDS is available for research purpose.</p> <p>(E) Health Centre, canteens, guest house, banks and post office are available for the students.</p>
16.	Incubators set up by University for Entrepreneurship Development	:	Institute has set up Asoke Sen Design & Innovation Centre , which will include Design Facility, Tinkering Lab and an Advanced Prototyping facility.
17.	University Ranking (A) NAAC (B) NIRF (C) Global Ranking	:	<p>(A) NAAC: N/A</p> <p>(B) NIRF: Rank in Engineering : 46th Rank in Overall: 93rd</p> <p>(C) Global Ranking: Not available</p>
18.	Nearby institutions engaged in Biotechnology research and teaching.	:	<p>Visva Bharati Center of Biotechnology University of Burdwan Department of Biotechnology</p>
19.	Linkage with nearby Industry engaged in Biotechnology R&D for Students Skill Training (Summer/Winter Training) as per Standards of Sector Skill Development Councils.	:	<p>BioBharati LifeScience Pvt. Ltd EN-35, First floor, Salt Lake, Sector - V, Kolkata - 700091, West Bengal, INDIA</p> <p>TCG Lifesciences Pvt. Limited Plot No-7, Salt Lake Electronics Complex, BN Block, Sector V, Kolkata, West Bengal 700091</p>
20.	Semester-wise course content with Learning outcome (Please enclose details as per Annexure-I).	:	Please see Annexure-I
21.	Financial assistance (Recurring and Non-recurring) required for Program (Please enclose break-up of funds required under different heads year wise with full justification)	:	Please see Annexure D

22.	Fee structure/student/semester (Including all Charges)	:	Please see Annexure E
23.	Academic Calendar (enclose Copy of University/Institute Notification)	:	Please see Annexure F
24.	Name of the coordinating Department (Mode of disbursement of studentship to be clearly defined)	:	<p>Department of Biotechnology</p> <p>Scholarship of one year is required to be disbursed in advance; students will receive the monthly scholarship through the office of the Dean (Students' Welfare).</p> <p>Details of the bank account is given in Annexure-G.</p>

<p>25. Name and full address of the Course coordinator with Telephone Nos. (office and residence), Telex, Fax, e-mail etc.</p> <p>Name and full address of the Vice-Chancellor/ Director with Telephone Nos. (office and residence), Telex, Fax, email etc.</p>	<p>CORDINATORS:</p> <p>Dr. Sudit Sekhar Mukhopadhyay Professor Department of Biotechnology NIT Durgapur Durgapur-713209, West Bengal, India Ph # 09434788139 (Office) 09830440945 (Mobile) Fax: 91-343-2547375 e-mail: sudit.mukhopadhyay@bt.nitdgp.ac.in</p> <p>Dr. Ashish Bhattacharjee Associate Professor Department of Biotechnology NIT Durgapur Durgapur-713209, West Bengal, India Ph # 09434788034 (Office) 09433924013 (Mobile) Fax: 91-343-2547375 e-mail: ashish.bhattacharjee@bt.nitdgp.ac.in</p> <p>DIRECTOR:</p> <p>Dr. Anupam Basu Professor NIT Durgapur Durgapur-713209, West Bengal, India Ph # 0343 2546397 (Office) Fax # 0343 2547375 e-mail: director@admin.nitdgp.ac.in</p>
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* Each student selected should receive stipend/fellowship every month. The stipend/Fellowship should be credited to the account of the student by 30th or 31st of each month as the case may be.

<p>Signature of the Head of the Institute/University (Director/Registrar) with Stamp</p>	<p>Signature of the Program Coordinator with Stamp</p>
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Soumya Sen Sharma
13.01.2020

SOUMYA SEN SHARMA
Registrar
National Institute of Technology
Mahatma Gandhi Avenue
Durgapur-713209 (W.B.) India

Sudit S. Mukhopadhyay 11/01/2020

Dr. Sudit Sekhar Mukhopadhyay
Professor
Department of Biotechnology
National Institute of Technology Durgapur
Durgapur - 713209, West Bengal, India

Ashish Bhattacharjee 11/01/2020

Dr. Ashish Bhattacharjee
Associate Professor & Ramalingaswami Fellow
Department of Biotechnology
National Institute of Technology Durgapur
Durgapur - 713209, West Bengal, India

Swath. Chakr. 11/1/2020
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Head
Department of Biotechnology
National Institute of Technology Durgapur
Durgapur-713209, W.B., India

Details of the Collaborative Department Proposed for Teaching and Training in Biotechnology

S. No.	Name of Department	Name and Address of Head of the Department	Faculty Details (Name and designation) *	Written Consent Enclosed (Yes/No)
1	Biotechnology	Dr. Surabhi Chaudhuri Professor Department of Biotechnology NIT Durgapur Durgapur-713209, West Bengal, India Ph # +91-9434788095 surabhi.chaudhuri@bt.nitdgp.ac.in	Sudip Chattopadhyay HAG Professor	Yes
2	Biotechnology		Sudit Sekhar Mukhopadhyay Professor	Yes
3	Biotechnology		Subhankar Roy Barman Associate Professor	Yes
4	Biotechnology		Ashish Bhattacharjee Associate Professor	Yes
5	Biotechnology		Sougata Saha Assistant Professor	Yes
6	Biotechnology		Sudipta Mondal Assistant Professor	Yes
7	Physics	Dr. Pathik Kumbhakar Professor Department of Physics NIT Durgapur Durgapur-713209, WB, India Ph # +91-9434788090 pathik.kumbhakar@phy.nitdgp.ac.in	Hemachander Subramanian Assistant Professor	Yes
8	Physics		Sayantari Ghosh Assistant Professor	Yes
9	Mathematics	Dr. Pinaki Pal Associate Professor Department of Mathematics NIT Durgapur Durgapur-713209, WB, India Ph # +91-9434788193 pinaki.pal@maths.nitdgp.ac.in	Seema Sarkar (Mondal) Professor	Yes
10	Mathematics		Sarit Maitra Associate Professor	Yes

* Enclose written consent of individual faculty members of collaborative Departments for participation in proposed Teaching and Training Program (M.Sc./M.Tech. Program) in Biotechnology.

Curriculum of M.Sc. Life Sciences

First Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 1001	Biochemistry	4	0	0	4
2	LS 1002	Microbiology & Molecular Biology	4	0	0	4
3	LS 1003	Methods in Biology	2	0	0	2
4	LS 1004	Cell Biology & Molecular Genetics	4	0	0	4
5	LS 1005	Physics, Chemistry & Mathematics for Biologists	4	0	0	4
6	LS 1006	Biochemistry Laboratory	0	0	3	1.5
7	LS 1007	Microbiology Laboratory	0	0	3	1.5
8	LS 1008	Cellular & Molecular Biology Laboratory	0	0	4	2
		Total Credit				23

Second Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 2001	Omics & Bioinformatics	4	0	0	4
2	LS 2002	Immunology	4	0	0	4
3	LS 2003	Biophysics & Structural Biology	4	0	0	4
4	LS 2004	Genetic Engineering	3	0	0	3
5	LS 2005	Plant & Animal Biotechnology	3	0	0	3
6	LS 2006	Immunology Laboratory	0	0	3	1.5
7	LS 2007	Genetic Engineering Laboratory	0	0	3	1.5
8	LS 2008	Bioinformatics Laboratory	0	0	4	2
		Total Credit				23

Third Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 3001	Critical Analysis of Classical Papers & Seminar	0	0	2	2
2	LS 3002	Elective I	2	0	0	2
3	LS 3003	Elective II	2	0	0	2
4	LS 3004	Biosafety & Bioethics	2	0	0	2
5	LS 3005	IPR and Entrepreneurship	2	0	0	2
6	LS 3006	Project Work - I	0	0	30	10
7	LS 3007	Project Seminar - I	0	0	2	2
		Total Credit				22

Fourth Semester

Sl. No.	Subject Code	Subject	L	T	P	CP
1	LS 4001	Project Work - II	0	0	30	15
2	LS 4002	Project Seminar - II	0	0	2	2
3	LS 4003	Project Viva	0	0	3	3
4	LS 4004	Scientific Communications & Presentation	1	1	0	2
		Total Credit				22

Total Program Credit: 90**List of Electives:**

1. Bioprocess Engineering & Technology
2. Drug Discovery and Development
3. Environmental biotechnology
4. Nano-biotechnology
5. Physiology, Ecology & Evolution
6. Cancer Biology

7. Developmental Biology and Signal Transduction
8. Enzymology & Bioenergetics
9. Protein Engineering
10. Molecular Virology
11. Nutraceuticals and nutrigenomics

Annexure – D

Budget for required financial assistance (Recurring and Non-recurring)

OVERALL BUDGET OF THE PROGRAMME FOR 5 YEARS						
	Year 1 (Rs.)	Year 2 (Rs.)	Year 3 (Rs.)	Year 4 (Rs.)	Year 5 (Rs.)	Total (Rs.)
Non recurring	4000000	3900000	2500000	1000000	1000000	12400000
Recurring						
Practical consumable	1000000	1000000	1100000	1200000	1300000	5600000
Fellowship @ of Rs. 5000/month for 15 students	900000	1800000	1800000	1800000	1800000	8100000
Project work	750000	750000	750000	750000	750000	3750000
Contingency and travel	300000	300000	300000	300000	300000	1500000
Overhead	695000	775000	645000	505000	530000	3150000
Total	7645000	8525000	7095000	5555000	5680000	34500000

Proposed Non Recurring expenditure for the Year 1			
Name of the instruments	Quantity	Price/unit Rs. in Lakhs	Total cost Rs. in Lakhs
Chemidoc Geldoc	1	12	12
Student microscope	2	0.5	1
Microcentrifuge	2	1	2
Vortex	5	0.12	0.6
Magnetic stirrer/heating plate	5	0.5	2.5
pH meter	5	0.5	2.5
Balance (coarse)	1	0.2	0.2
BOD incubator	1	1.5	1.5
Freezer	2	0.25	0.5
Pipet sets	6	0.4	2.4

DNA gel running apparatus	2	0.5	1
Protein gel running apparatus with transblot	1	1.5	1.5
Power pack	1	0.5	0.5
PCR machine	1	3	3
Refrigerated centrifuge	1	5	5
Water bath	2	0.5	1
Dry bath	2	0.5	1
Rocker	2	0.5	1
Microwave	1	0.3	0.3
Printer	2	0.25	0.5
Total			40

Proposed Non Recurring expenditure for the Year 2			
Name of the instruments	Quantity	Price/unit Rs. in Lakhs	Total cost Rs. in Lakhs
Student microscope	3	0.5	1.5
Microcentrifuge	3	1	3
Balance (fine)	1	1	1
Hot air oven	2	0.5	1
Refrigerated incubator	1	5	5
Freezer	0	0.25	0
Minus 20°C freezer	1	1	1
Minus 80°C freezer	1	5	5
DNA gel running apparatus	3	0.5	1.5
Protein gel running apparatus with transblot	1	1.5	1.5
Power pack	1	0.5	0.5
Refrigerated centrifuge	1	5	5
UV/Vis spectro with plate reader	1	5	5
Laminar air flow hood	2	1.5	3
Autoclave	2	1	2
Circulating water bath	1	3	3
Total			39

Proposed Non Recurring expenditure for the Year 3
--

Name of the instruments	Quantity	Price/unit Rs. in Lakhs	Total cost Rs. in Lakhs
Computer	10	0.6	6
UPS	10	0.25	2.5
Photocopier	1	4	4
Projector	3	0.5	1.5
Video conferencing facility, audio system and accessories for seminar room	1	11	11
Total			25

Proposed Non Recurring expenditure for the Year 4			
Name of the item	Quantity	Price/unit Rs. in Lakhs	Total cost Rs. in Lakhs
AMCs	1	5	5
Repair / Maintenance	1	5	5
Total			10

Proposed Non Recurring expenditure for the Year 5			
Name of the item	Quantity	Price/unit Rs. in Lakhs	Total cost Rs. in Lakhs
AMCs	1	5	5
Repair / Maintenance	1	5	5
Total			10

Budget justifications:

NON RECURRING:		
Sl. No.	Instrument /Item	Justifications
1	Chemidoc Geldoc	1. These instruments are intended to be used for the development of the laboratory facilities. As Department of Biotechnology at NIT Durgapur runs three other programmes: B. Tech. and M. Tech in biotechnology and Ph.D. programme, the existing instruments are used heavily. Thus for the
2	Student microscope	
3	Microcentrifuge	
4	Vortex	
5	Magnetic stirrer/heating plate	

6	pH meter	<p>starting of this new programme the instruments are utterly necessary.</p> <p>2. For setting up the laboratory, it is intended to set up 5 independent work benches. That is the reason basic instruments like Microcentrifuge, Vortex, pH meter, Stirrer and pipette sets are proposed in 5 numbers each.</p>	
7	Balance (coarse)		
8	Balance (fine)		
9	Hotair oven		
10	BOD incubator		
11	Refrigerated incubator		
12	Freezer		
13	Minus 20C freezer		
14	Minus 80C freezer		
15	Pipet sets		
16	DNA gel running apparatus		
17	Protein gel running apparatus with transblot		
18	Power pack		
19	PCR machine		
20	Refrigerated centrifuge		
21	UV/Vis spectro with plate reader		
22	Laminar air flow hood		
23	Autoclave		
24	Circulating water bath		
25	Water bath		
26	Dry bath		
27	Rocker		
28	Microwave		
29	Computer		<p>1. Computers and peripherals will be necessary to set up a new bioinformatics laboratory. In the initial years department intend to use its existing bioinformatics laboratory. However, in future with increase of load on the facility, development of an independent facility will be necessary.</p> <p>2. Computers and peripherals also will be helpful in printing question papers etc.</p>
30	UPS		
31	Printer		
32	Photocopier		
33	Projector		<p>These are intended to develop a seminar facility cum video conferencing facility which will be necessary for course presentation and arranging interactive sessions of the students with industry experts and academic scientists.</p>
34	Video conferencing facility, audio system and accessories for seminar room		
35	AMC	<p>Maintenance of small instruments and sophisticated instruments.</p>	
36	Repair		

RECURRING:		
Sl. No.	Item	Justifications
1	Practical consumable	To conduct following 5 practical courses for 15 students every year consumables like plastic ware, glass ware, chemicals, media, enzymes, kits etc. need to be purchased. LS 1006- Biochemistry Laboratory, LS 1007-Microbiology Laboratory, LS 1008-Cellular & Molecular Biology Laboratory, LS 2006-Immunology Laboratory, and LS 2007-Genetic Engineering Laboratory
2	Fellowship @ of Rs. 5000/month for 15 students	To provide fellowship of 15 students in the first year and 30 students in following years.
3	Project work	To conduct 1 year-long project work of 15 students in every year. The expenditure under this is also proposed in the first year to facilitate project work of the 2 nd year.
4	Contingency and travel	Contingency is proposed for: 1. To meet recurring expenses like CO ₂ gas and liquid N ₂ which will be required for culturing animal cells and storing animal cells. 2. To meet some of the office expenses and well. Travel expenses: 1. To conduct syllabus committee meetings. 2. To meet travel expenses of invited lecturers from industry and academia. 3. To meet travel expenses related to operation of the programme.
5	Overhead	Overhead charges are proposed to facilitate the institute to provide and maintain basic infrastructure for running the programme.

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21-10-17

ANNEXURE 56.9

National Institute of Technology Durgapur

ANNEXURE 56.9

Note-Sheet

Date: 17.10.2019

This is to inform you that the total number of PhD students (Category A) under Institute Scholarship has been admitted during the last few academic years are given below:

Year	Sanctioned intake	Admission taken	Semester	Vacant position
2016-2017	60	46	Odd + Even	14
2017-2018	60	25	Odd + Even	35
2018-2019	60	46	Odd + Even	14
2019-2020	67	42	Odd	25

From the above statistics it is observed that around 10 PhD position will be vacant in every years due to non-availability of reserved category students. Considering this vacant position, scholarship of 10 Institute research scholars of Rs.3,10,000/- per month is not utilised.

On the other hand, currently, scholarship of 12 Institute research scholars of Rs.4,99,200/- per month is paid from COE fund. Out of which Institute paid Rs.3,04,000/- per month to Project Assistants employed by COE. So the balance amount of Rs.1,95,200/- per month is now unutilised and kept in the Institute account.

Therefore, the total amount of monthly unutilised funds (on scholarship head) of Rs.5,05,200.00/- (Rs.3,10,000/- + Rs.1,95,200/-) can be utilised by employing 10 new Post-Doctoral Fellowship (PDF) in the Institute with scholarship Rs.50,000/- per month for initially one year.

This note-sheet is now submitted to Director for his kind approval and necessary action.

Meikap
A K Meikap 17/10/19
Dean (R&C)

Director

Be placed in Secret
[Signature]
15/10/19

U Prof. P. P. Gupta
Copy: 12/Registration

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ANNEXURE 56.11

September 16, 2019

ANNEXURE 56.11.

To
The Registrar
National Institute of Technology Durgapur
Durgapur 713209, West Bengal

Dear Sir,

I would like to request you to kindly consider the enclosed document for the next Senate Meeting for discussion.

Thanking you,

Sincerely,

Sudip Chattopadhyay
Sudip Chattopadhyay, PhD 16/9/19.

Professor, Department of Biotechnology

NIT Durgapur, Durgapur 713209

AR (Legal)
13/09
17/09

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Office Order Ref. no: NITD/Regis/OR/52nd Senate (dated: January 17, 2019)

Minutes of the meeting on framing the policy and mechanism for the award of doctorate Honoris Causa to eminent persons in the convocation. (2nd meeting; dated August 19, 2019)

The meeting was held on August 19, 2019 in the Dept. of Biotechnology. The following members were present in the meeting:

1. Professor Parimal Pal, Dept. of Chemical Engineering *Parimal Pal*
19/08/2019
2. Professor Pathik Kumbhakar, Dept. of Physics *Pathik Kumbhakar*
19/08/2019
3. Professor Seema Sarkar (Mandal), Dept. of Mathematics *Seema Sarkar (Mandal)*
19.08.2019
4. Professor Sudip Chattopadhyay, Dept. of Biotechnology *Sudip Chattopadhyay*
19-08-19

The following resolutions, subsequent to previous resolution of May 2, 2019, were taken regarding the policy and mechanism for the award of doctorate Honoris Causa to eminent persons in the convocation:

As per request of the Search and Selection Committee (SSC), each Department may suggest for consideration of two names, one for honorary DLit and one for honorary DSc, to the SSC committee through Departmental Academic Committee (DAC). The Department will provide a brief write up on the credential of the suggested candidates along with their contact details. Importantly, during such nomination by the department, the suggested person(s) should never be contacted. The SSC committee may also add names of the candidates independently. From all these prospective Doctorate Honoris Causa candidates, SSC committee will select and send five names each for DLit and DSc for consideration of the award of Doctorate Honoris Causa to the Final Nomination Committee (FNC).

The FNC will critically study the credentials of all ten prospective candidates and nominate two names each for DLit and DSc, and recommend to the Chair, Senate for final decision. The award of Doctorate Honoris Causa will be given to maximum two persons each year.

The committee suggested the following names as members for two different committees (SSC and FNC):

Search and Selection Committee (SSC)

Prof. Dipankar Sukul, Chemistry
Prof. Subhrabrata Choudhury, CSE
Prof. Tamal Mandal, ChE
Prof. Sudit S. Mukhopadhyay, BT
Prof. Avijan Dutta, MS
Prof. Amit K. Chakraborty, Physics

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Final Nomination Committee (FNC)

Prof. Subrata Banerjee, EE

Prof. Kajla Basu, Mathematics

Prof. Goutam Mohanty, ECE

Prof. Amarnath Mullick, ME

Prof. Purnendu Roy, CE

Sudip Chatterjee
19/08/13

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NIT
DURGAPUR

ANNEXURE 56.12

Registrar Office <registrar.office@admin.nitdgp.ac.in>

ANNEXURE 56.12

Fwd: Online(Hybrid) Courses to be offered by DMS

Registrar NIT Durgapur <registrar@admin.nitdgp.ac.in>
To: Registrar Office <registrar.office@admin.nitdgp.ac.in>

Wed, Jan 15, 2020 at 4:46 PM

----- Forwarded message -----

From: **Avijan Dutta** <avijan.dutta@dms.nitdgp.ac.in>

Date: Wed, Oct 30, 2019 at 4:46 PM

Subject: Online(Hybrid) Courses to be offered by DMS

To: Parthapratim Gupta <parthapratim.gupta@che.nitdgp.ac.in>, Nirmal Kumar Roy <nirmalkumar.roy@ee.nitdgp.ac.in>, <kartikghanta@gmail.com>, Registrar NIT Durgapur <registrar@admin.nitdgp.ac.in>, Neelotpaul Banerjee <neelotpaul.banerjee@dms.nitdgp.ac.in>

Dear Sirs

Please find the attached proposals for online courses that DMS intends to offer. The course duration may be either two years or three years subject to approval from the Senate. The detailed outline of the courses are attached herewith.

I request you all to give your feedback and suggestions before formal meeting.

Thanks and regards
Prof Avijan Dutta
DMS, NIT Durgapur

--
Soumya Sen Sharma
Registrar
National Institute of Technology Durgapur
Mahatma Gandhi Avenue, Durgapur 713209, West Bengal (India)

2 attachments

 **Hybird_MBA_DMS_2019_2Years (1).pdf**
135K

 **Hybird_MBA_DMS_2019_3Years.pdf**
139K

PROPOSAL FOR

MBA 2 Year Program (HYBRID) 2020-2022

This MBA Programme is specially designed to cater to those who don't have enough time to attend regular classes during week days and want more flexibility in their learning schedule. Department of Management Studies (DMS) would like to introduce a 2 year hybrid mode learning schedule with weekend contact classes at NIT Durgapur campus as well as online classes. Recommended NPTEL/MOOCs courses are also incorporated in this curriculum to reduce the contact hours and provide more flexibility in learning.

Programme Objectives

The program aims to:

- Provide flexibility in learning.
- Provide in depth understanding of business management concepts across different functional areas.
- Equip participants with the tools and skills required for understanding the operational aspects of business and decision making.

Eligibility Criteria

- Candidates applying for the MBA 2 Year Program (HYBRID) should have:
A Bachelor's degree after (10+2) in any discipline from a recognized university.

Selection Procedure

- Applicant shall have to appear for written entrance test (objective/subjective) to be conducted by the Department of Management Studies, NIT Durgapur.
- Final selection shall be based on aggregate scores of written test and Experience.
- The proposed strength for the MBA 2 Year Program (HYBRID) is 60.

Program Fee

- The programme fee is Rs. 1,25,000 payable in three instalments in two years.

Curriculum of MBA 2 Year Program (HYBRID)

FIRST SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1		Organizational Behavior	3-0-0	3
2		Marketing Management I	3-0-0	3
3		Quantitative Techniques for Managers I	3-0-0	3
4		Financial Accounting for Managers	3-0-0	3
5		Microeconomics: Theory and Applications	3-0-0	3
6		Cost Accounting for Managers	3-0-0	3
7		Research Methodology I	3-0-0	3
8		Management Lab I	0-0-3	2
TOTAL				23

SECOND SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1		Human Resource Management	3-0-0	3
2		Quantitative Techniques for Managers II	3-0-0	3
3		Research Methodology II	3-0-0	3
4		Marketing Management II	3-0-0	3
5		Indian Business Environment	3-0-0	3
6		Information Systems for Business	3-0-0	3
7		Strategic Management I	3-0-0	3
8		Financial Management	3-0-0	3
9		Management Lab II	0-0-3	2
TOTAL				26

THIRD SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1		International Business and E -Commerce	3-0-0	3
2		Business Ethics and Corporate Governance	3-0-0	3
3		Supply Chain Management	3-0-0	3
4		Managerial Entrepreneurship	3-0-0	3
5		Corporate and Business Law	3-0-0	3
6		Elective I	3-0-0	3
7		Elective II	3-0-0	3
8		Elective III	3-0-0	3
TOTAL				24

FOURTH SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1		Strategic Management II	3-0-0	3
2		Project Management	3-0-0	3
3		Elective IV	3-0-0	3
4		Elective V	3-0-0	3
5		Elective VI	3-0-0	3
7		Project and Seminar Presentation	0-0-11	12
TOTAL				27

DEPARTMENTAL ELECTIVES

SEMESTER III

SL No	Subject Code	Subject	L-T-P	Credits
		Security Analysis and Portfolio Management	3-0-0	3
		Banking Management	3-0-0	3
		Infrastructure Finance	3-0-0	3
		Financial Modeling Using Excel	3-0-0	3
		Corporate Finance	3-0-0	3
		Consumer Behaviour	3-0-0	3
		Management of New Product and Services	3-0-0	3
		E-business	3-0-0	3
		Service Marketing	3-0-0	3
		Marketing Research and Analysis I	3-0-0	3

SEMESTER IV

SL No	Subject Code	Subject	L-T-P	Credits
		International Finance	3-0-0	3
		Financial Services and Market	3-0-0	3
		Financial Statement Analysis and Reporting	3-0-0	3
		Financial Derivatives & Risk Management	3-0-0	3
		Corporate Taxation	3-0-0	3
		Sales and Distribution Management	3-0-0	3
		Rural Marketing	3-0-0	3
		Global Marketing Management	3-0-0	3
		Strategic Marketing-Contemporary Issues	3-0-0	3
		Marketing Research and Analysis II	3-0-0	3

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PROPOSAL FOR

MBA 3 Year Program (HYBRID) 2020-2023

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Programme Objectives

The program aims to:

- Provide flexibility in learning.
- Provide in depth understanding of business management concepts across different functional areas.
- Equip participants with the tools and skills required for understanding the operational aspects of business and decision making.

Eligibility Criteria

- Candidates applying for the MBA 3 Year Program (HYBRID) should have:
A Bachelor's degree after (10+2) in any discipline from a recognized university.

Selection Procedure

- Applicant shall have to appear for written entrance test (objective/subjective) to be conducted by the Department of Management Studies, NIT Durgapur.
- Final selection shall be based on aggregate scores of written test and experience.
- The proposed strength for the MBA 3 Year Program (HYBRID) is 60.

Program Fee

- The programme fee is Rs. 1,40,000 payable in three instalments in three years.

Curriculum of MBA 3 Year Program (HYBRID)

FIRST SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1		Organizational Behavior	3-0-0	3
2		Marketing Management I	3-0-0	3
3		Quantitative Techniques for Managers I	3-0-0	3
4		Financial Accounting for Managers	3-0-0	3
5		Microeconomics: Theory and Applications	3-0-0	3
TOTAL				15

SECOND SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1		Quantitative Techniques for Managers II	3-0-0	3
2		Cost Accounting for Managers	3-0-0	3
3		Marketing Management II	3-0-0	3
4		Research Methodology I	3-0-0	3
5		Information Systems for Business	3-0-0	3
6		Management Lab I	0-0-3	2
TOTAL				17

THIRD SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1		Human Resource Management	3-0-0	3
2		Indian Business Environment	3-0-0	3
3		Research Methodology II	3-0-0	3
4		Strategic Management I	3-0-0	3
5		Financial Management	3-0-0	3
6		Management Lab II	0-0-3	2
TOTAL				17

FOURTH SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1		International Business and E -Commerce	3-0-0	3
2		Business Ethics and Corporate Governance	3-0-0	3
3		Managerial Entrepreneurship	3-0-0	3
4		Elective I	3-0-0	3
5		Elective II	3-0-0	3
6		Elective III	3-0-0	3
TOTAL				18

FIFTH SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1		Strategic Management II	3-0-0	3
2		Supply Chain Management	3-0-0	3
3		Corporate and Business Law	3-0-0	3
4		Elective IV	3-0-0	3
5		Elective V	3-0-0	3
6		Elective VI	3-0-0	3
TOTAL				18

SIXTH SEMESTER

Sl. No	Sub. Code	Subject	L-T-P	Credits
1		Project Management	3-0-0	3
2		Project and Seminar Presentation	0-0-11	12
TOTAL				15

DEPARTMENTAL ELECTIVES

SEMESTER IV

SL No	Subject Code	Subject	L-T-P	Credits
		Security Analysis and Portfolio Management	3-0-0	3
		Banking Management	3-0-0	3
		Infrastructure Finance	3-0-0	3
		Financial Modeling Using Excel	3-0-0	3
		Corporate Finance	3-0-0	3
		Consumer Behaviour	3-0-0	3
		Management of New Product and Services	3-0-0	3
		E-business	3-0-0	3
		Service Marketing	3-0-0	3
		Marketing Research and Analysis I	3-0-0	3

SEMESTER V

SL No	Subject Code	Subject	L-T-P	Credits
		International Finance	3-0-0	3
		Financial Services and Market	3-0-0	3
		Financial Statement Analysis and Reporting	3-0-0	3
		Financial Derivatives & Risk Management	3-0-0	3
		Corporate Taxation	3-0-0	3
		Sales and Distribution Management	3-0-0	3
		Rural Marketing	3-0-0	3
		Global Marketing Management	3-0-0	3
		Strategic Marketing-Contemporary Issues	3-0-0	3
		Marketing Research and Analysis II	3-0-0	3

**Report
on
Modalities for offering Masters Programmes
with other Institutes/Universities**

(Ref. Resolution # 54.14 of the 54th Senate Meeting held on July 30, 2019)

Submitted to
Chairman, Senate



August, 2019

National Institute of Technology Durgapur

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Modalities for offering Masters Programmes with other Institutes/Universities

1. Definitions:

- (a) "NITD" means National Institute of Technology Durgapur.
- (b) "Foreign Educational Institution" means (i) an institution duly established or incorporated in its home country, offering educational programmes at the undergraduate, masters and higher levels in its home country and (ii) which proposes to offer a programme of study leading to the award of a master degree in a collaborative arrangement with NITD;
- (c) "Indian Educational Institution" means (i) an institution/university duly established in India, offering educational programmes at the undergraduate, masters and higher levels in India and (ii) which proposes to offer a programme of study leading to the award of a master degree in a collaborative arrangement with NITD;
- (d) "Collaboration", means an arrangement between NITD and a Foreign / Indian Educational Institution, put into place through an MoU leading to the award of a master degree;
- (e) "Degree" means a degree awarded by NITD;
- (f) A "Joint Master Degree" means a single master degree jointly awarded by NITD and the collaborating Foreign/Indian Educational Institution;

2. Objectives:

The primary objectives for offering Masters Programmes with other institutes/ Universities are furnished below.

- (a) Facilitate collaboration programme between NITD and Foreign/ Indian Universities/ Institutions to improve the quality of education in the field of science, technology, **humanities and social sciences** and research.
- (b) Increase internationalisation of the institutions
- (c) Develop study and research alternatives in accordance with emerging needs
- (d) Offer students an expanded and innovative arena for learning
- (e) Increase candidates' employability and motivation for mobility in a global market
- (f) Increase competence at the partner institutions through cooperation and implementation of a best practice system
- (g) Contribute to tearing down cultural barriers, both personal and institutional

3. Eligibility criteria and conditions for collaborations:

- (a) In case the partner institution is a foreign educational Institution, it must be accredited by authorized accreditation agency in its parent country.

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- (b) In case the partner institution is an Indian educational Institution, it must be ranked within top 100 universities overall as per NIRF ranking or must have a THE/QS ranking.
- (c) Any course or programme which jeopardizes the national interest shall not be allowed to be offered.
- (d) Legalities and matters relating to the grievances of Indian students shall be addressed by NITD.

4. Types of Joint Master Programme

4.1 Collaborative Masters Programme: It refers to a situation when two institutions cooperate on a joint study programme that leads to a degree at one of the partner institutions. Each institution is responsible for admission and the award of degrees to its own students. The programme is developed and managed jointly, but each institution "owns" its own students.

The curriculum, syllabus, mode of delivery and other related issues may be developed and approved jointly. Credits earned at one institution shall be accepted by the other collaborating institution. However, the grade cards, transcripts and the degree shall be awarded by one institution. The degree certificate may indicate that the degree was offered in collaboration with another institution.

4.2 Joint Master Degree Programme: It refers to collaboration between two institutions on a joint study programme leading to the award of a joint master degree. The degree certificate should include the name of all participating institutions and their seals. All partner institutions are responsible for the entire programme and not just their own students. The students admitted should spend at least one semester in a foreign/Indian partner Institution for course work. Thesis should be supervised jointly.

The curriculum, syllabus, mode of delivery and other related issues shall be developed and approved jointly.

5. Criteria for assessing the suitability of the programme

The following criteria should be considered when assessing if NITD should enter into the joint master programme.

- (a) Joint master programmes should be relevant to the society.
- (b) Joint masters programmes should be in consonance with the strategic and academic priorities of NITD
- (c) Joint master programmes should be within an academic field where NITD has relevant competence.
- (d) Joint master programmes should stimulate increased student mobility
- (e) Joint master programmes should strengthen research-based teaching and collaboration.
- (f) Joint master programmes should be supported by the academic community and by the institution.
- (g) Academic, administrative and economic resources must be available. A list of faculty members willing to participate in the programme should be submitted along with the NOC from concerned academic departments/centres of excellence.

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6. Programme Elements

The following programme elements should be decided based on mutual discussion/communication.

- (a) Name of the degree
- (b) Type of Programme (Collaborative Master Programme / Joint Master Degree Programme)
- (c) Language of instruction
- (d) Place of study for different courses; residential requirement at the partner institution for coursework
- (e) The relevance of the programme
- (f) Expected learning outcome on completion of the programme (knowledge, skills and general competence)
- (g) Eligibility criteria and Admission procedure
- (h) Sanctioned intake of students
- (i) The academic curriculum and credit requirements
- (j) Syllabus, pedagogy and modes of delivery (including online courses)
- (k) Possible joint thesis supervision and expected outcome in terms of joint publications, IPR etc.
- (l) Assessment methods and the grading scales used at the respective partner institutions. If the grading scales are different, equivalence has to be specified.
- (m) Fee structure of the NITD students and their possible fee waiver for the courses at the partner institution and vice versa
- (n) Financial assistance to the students
- (o) Accommodation facility for NITD students at the partner institution and the students of the partner institution at NITD
- (p) Transfer of credits, if applicable

7. Agreement Process

MoU should be signed among the partner institutions for each programme as detailed below.

- (a) The eligibility of the partner institution(s) should be assessed.
- (b) The suitability of the masters programme should be assessed by NITD and the possible partner institution(s) (cl. 5)
- (c) The type of the masters programme (Collaborative Masters Programme / Joint Degree Programme) should be selected (cl. 4).
- (d) The programme elements (cl. 6) should be finalized.
- (e) An MoU incorporating the programme details shall be placed to the Senate for recommendation.
- (f) The MoU shall be placed to the BoG of NITD for endorsement (foreign institutions) / for approval (Indian institutions).
- (g) In case the partner institution is foreign, the MoU shall be submitted to the MHRD, Government of India for approval.
- (h) Appropriate approval shall be obtained by the partner institution(s) too as per their requirement.
- (i) The MoU shall be signed by the Director/Vice Chancellor/President or the competent authority of the partner institutions.

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- (j) The agreement must indicate that Collaborative/Joint Master Degree Programme shall start after all details are approved by both Institutions.
- (k) The MoU shall indicate its date of enforcement, duration of the agreement and procedures related to amendments, renewal or termination.

8. Conduct of the Joint Masters Programme

- (a) Any department(s) /centre(s) of excellence at NITD shall be eligible to offer the programme on behalf of NITD.
- (b) A Programme Coordinator in each participating institute shall coordinate the programme on behalf of that institution. All correspondence related to the programme must be made by participating institutions through the Programme Coordinator.
- (c) A Programme Academic Committee (PAC) shall be constituted at NITD to take care of the administrative and academic activities for the programme. If the programme is offered by a single academic department / centre of excellence, its DPAC will act as the PAC. If it is a joint endeavour of more than one department/centre, the PAC shall act as the DPAC for the programme.
- (d) Further academic decision-making shall be routed through DPAC, PGAC and the Senate.

9. Other type of Joint Masters Programmes

NITD may also participate in the reputed International Joint Masters Programmes like Erasmus Mundus Joint Master Degrees as per their terms and conditions. NITD may also participate in such similar programmes if organized by the Government of India in future.

References:

1. The Gazette of India, University Grants Commission Notification, 11th July, 2016
2. All India Council for Technical Education Approval Process Handbook (2017 – 2018)
- 3.

https://www.joiman.eu/ProjectResults/PublicDeliverables/JOIMAN%20template_JP_final.pdf - Guide to developing and running joint programmes at bachelor and master's level - a template.

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NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR**STRATEGIC PLAN**

The Institute Strategy document was prepared to reaffirm its commitment to excellence in technical education and research, develop life-long learning and analytical capabilities and inculcate values and ethics among the students and contribute meaningfully to the society. The students would be expected to contribute significantly to the industries and be encouraged to take up higher education, research and entrepreneurship. Innovation and flexibility would be at the focus of all endeavours. Emphasis shall be placed on the outreach activities.

The Institute envisions its place among the top premier institutions in the world in a foreseeable future. To achieve that, the Vision and Missions of the Institute were formulated, a few long-term and short-term goals were identified, and the action plans were decided upon.

1. Vision:

To impart quality technical education and focus on research and innovation to cater to the need of the country

2 Mission:

1. To impart quality technical and scientific education and produce engineers, technologists, scientists and citizens who will contribute meaningfully to the growth and development of the country and excel in various disciplines of knowledge
2. To initiate the students to research-oriented teaching-learning environment in the Institute with a focus on excellence and innovation

3. Goals:

The following goals, long-term and short-term, were set to achieve the Vision and Missions.

3.1 Long-term Goals

- Provide transformational education to have life-long learning.
- Lead research and innovation to uplift the prestige of the country.
- Cultivate a community that embodies collaborative and inclusive excellence.
- Enhance engagement with the society and industry

3.2 Short-term Goals

- Become a leading educational institute, ranked in the top 10 of NIRF ranking in engineering category.
- Establish reputation in research and innovation for industrial and national needs
- Broaden the educational areas and funding base.
- Attract more number of international students and increase international collaborations.
- Enhance alumni linkage
- Develop cleaner and greener campus.

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4. Action Plan

To achieve the goals, a set of Action Plan in various domains of activities was prepared.

4.1 Academics (Teaching – Learning)

- Revision of curriculum to meet today's need of the Industry and society and allow flexibility to the students
- Increase in participation of industrial subject experts in the curriculum revision process and content delivery.
- Systematic conduct of regular academic audit in-line of the guidelines given by NIT Council.
- Initiatives to have all the programs accredited.
- Use of language laboratory, finishing school and soft skill development to improve the employability of the students.
- Create enthusiasm about higher studies among the students.
- Capacity increase in the demanding academic programs.
- Collaboration with other reputed academic institutes / organizations in India and abroad for student exchange program at all levels.
- Promoting development of e-learning courses
- More multi-disciplinary academic programmes to be developed
- Promoting participation in competitive sports and games and other extra-curricular activities.

4.2 Research

- Emphasizing on the research-spike areas including energy, environment and water management, assistive technology for people with special needs, etc.
- Increase in the number of quality research publications, patents, sponsored research and consultancy projects.
- Development of more numbers of industry / alumni-funded research facilities
- Encouraging Faculty members to conduct quality research in collaboration with reputed academic / research / industrial organizations.
- Increase in intake of PhD research scholars
- Development of tinkering laboratories for the UG students to get engaged in research early
- Quality improvement of the COEs, central research facilities established through HEFA
- Strengthening of Sponsored Research & Consultancy Cell

4.3 Human Resource Development

- Regular conduct of recruitment of faculty, staff and officers.
- Initiatives to create enthusiasm among the employees to be in continuous development process of the Institute and their all-round personal development.
- Increase in participation, organization of different faculty development process (refresher courses, pedagogical training, conferences and training programs in domain areas).

4.4 Infrastructure Development

(a) Hostel - Complete renovation of existing old hostels, increase in recreation, games and sports facilities, furniture in the hostels, development of a common mess catering diversified meals.

(b) Internet Facility – Improvement in the internet network for un-interrupted and high-speed connectivity at all corners of the Institute.

(c) Library – Increase in text and reference books, reading room facility, journal access, and RFID tagging of all textual materials and use of an ERP system, improvement of the ambience.

(d) Class Room – Modernization of existing class-rooms of the old academic building equipped with audio-visual aids. Increase in the number of more AC class rooms.

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(e) Workshop and Laboratory – Modernization and replacement of old equipments, expansion of existing UG and PG laboratories, creation of a RPT and 3D printing facility in the workshop, establishment of some laboratory equipments for learning beyond the syllabus and to have joy of engineering and technology.

(f) Capacity and facility enhancement of the academic and administrative buildings

(g) Use of a comprehensive ERP system

(h) Campus Facility - Promote and sustain a campus environment that supports a high quality of life and learning through continuous maintenance of quarters, medical unit, shops, roads, drainage and lighting systems, security, play grounds and campus beautification. Building a new space for Yoga and Counseling centre.

4.5 Outreach Activities

- **Societal Participation** - Unnat Bharat Aviyan, Rashtriya Avishkar Aviyan, Vigyan Prasar, Adoption of Rural Schools etc.
- Promoting organization of more and more GIAN, STCs, Collaborative Workshops and Conferences.
- Active participation in TEQIP-III, mentoring other institutes
- Increase in MOUs and Collaboration with the outside world.

4.6 Miscellaneous

(i) Improvement of ranking – The Institute aspires to secure an NIRF rank within 20 among the top engineering institutions in India. It would also like to be included in the QS and THE international ranking. All efforts shall be made to improve research, academic, placement performance and infrastructure to achieve it.

(ii) Strengthening of alumni networking – The Alumni Cell shall be rejuvenated to enhance interaction with the alumni. Support will be sought from them for creation of infrastructure and sharing their expertise for the development of the students and the faculty.

(iii) Strengthening of Industry-Institute-Interaction and I-I-I cell in the Institute – Greater interaction shall be made with the industries by way of collaborative projects, Industry PhD programme, visiting lectures by the industry experts and their participation in the academic committees and revision of curricula.

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ANNEXURE 56.16

ANNEXURE 56.16

NATIONAL INSTITUTE OF TECHNOLOGY DURGAPUR STUDENT FEEDBACK REPORT

Faculty Name :

Session :

Co-Faculty Name :

Branch/Group :

Semester :

Course Paper :

Paper Abbr :

Overall Rating :

No. of Classes Undertaken :

Overall Rating \geq 50 :

Total Feedback \geq 50% Attn. :

Total Feedback :

Question	RatingAll	Rating \geq 50% Attn.
1. Relevance / usefulness of the topics covered in the course		
2. Regularity of the class		
3. Pace of delivery of content		
4. Enthusiasm and preparedness in teaching the subject		
5. Clarity of presentation / teaching techniques		
6. Stimulation of interest in the subject		
7. Availability of Course Materials		
8. Approachability of the teacher inside and outside the classroom		
9. Creates opportunities to skill development (thought provoking discussion, problem solving and participation)		
10. Consistency of the question paper (coverage and balance)		

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Self Assessment of Students

11. Your effort in studying the course

12. Workload of this course in comparison with other courses

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