



सत्यमेव जयते

Government of West Bengal
Office of the Principal

GOVERNMENT GENERAL DEGREE COLLEGE, KESHIARY

At.-Telipukur : P.O.- Tilaboni Mahisamura : P.S.- Keshiary

Dist- Paschim Medinipur : PIN-721135

www.ggdckeshiary.ac.in

Criteria 1: Curricular Aspects

1.1. Curricular Planning and Implementation

1.1.1. The Institution ensures effective curriculum planning and delivery through a well-planned and documented process including Academic calendar and conduct of continuous internal Assessment

Contents

Institute curriculum planning

Institute has effective curriculum planning in a well-planned documented process for each and every Subject.

Bengali

Anthropology

English

Botany

Santali

Chemistry

History

Zoology

Political Science



Anil Chakraborty
Officer-in-Charge
Govt. Gen. Degree College
Keshiary

Curriculum Plan

AY 2022-2023

CBCS

BENGALI : Honours & General**(ODD SEMESTER)**

Semester I Hons		Period: 19.09.22 to 04.02.23		
Paper- C-1,C-2,GE-1		Full Marks: 75,75,75 Credit:6,6,6		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	C -1: বাংলা ভাষার উদ্ভব ও পরিচয়	40	Dr.Monua Panja	
2	C-2 বাংলা সাহিত্যের ইতিহাস (প্রাচীন ও মধ্যযুগ)	40	Ashok Das	
3	GE-1 বাংলা ভাষার বিভিন্ন স্তর ও বাংলা ভাষা চর্চা	40	Dr.Monua Panja	

Semester I General		Period: 19.09.22 to 04.02.23		
Paper- DSC-1A/DSC-2A		Full Marks: 75 Credit: 6		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	DSC-1A/DSC-2A বাংলা সাহিত্যের ইতিহাস ও বাংলা ভাষাতত্ত্ব	40	Ashok Das	

Semester III Hons		Period: 09.09.22 to 21.01.23		
Paper - C-5,C-6,C-7,SEC-1,GE-3		Full Marks: 75,75,75,50,75 Credit: 6,6,6,2,6		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	C-5 উনিশ-বিশ শতকের প্রবন্ধ ও কাব্য সাহিত্যের ইতিহাস এবং আখ্যান সাহিত্য পাঠ	40	Ashok Das	
2	C- 6 ছন্দ – অলঙ্কার ও নির্বাচিত কবিতা পাঠ	40	Dr.Monua Panja	
3	C- 7 প্রবন্ধ সাহিত্য পাঠ	40	Ashok Das	
4	SEC-1 বাংলা ব্যাকরণ ও অনুবাদতত্ত্ব	30	Dr.Monua Panja	
5	GE-3 উপন্যাস ও ছোটগল্প পাঠ	40	Dr.Monua Panja	

Semester III General		Period: 09.09.22 to 21.01.23		
Paper- DSC-1C/DSC-2C,SEC-1		Full Marks: 75,50 Credit: 6,2		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	DSC-1C/DSC-2C বাংলা কথাসাহিত্য, নাটক ও প্রবন্ধ	40	Ashok Das	
2	SEC-1 লিখন নৈপুণ্য বৃদ্ধি	30	Ashok Das	

Semester V Hons		Period: 16.08.22 to 23.12.22		
Paper - C-11,C-12,DSE-1,DSE-2		Full Marks: 75,75,75,75 Credit: 6,6,6,6		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	C-11 নাট্য পাঠ	40	Dr.Monua Panja	
2	C- 12 কাব্যতত্ত্ব, পাশ্চাত্য সাহিত্য সমালোচনা-তত্ত্ব ও সাহিত্যের রূপরীতি	40	Ashok Das	
3	DSE-1 সাহিত্য আন্দোলন, সমালোচনা ও রূপরীতি	40	Dr.Monua Panja	
4	DSE-2 বাংলা ছোটগল্প, ভ্রমণ কাহিনি ও গোয়েন্দা কাহিনি পাঠ	40	Ashok Das	

Semester V General		Period: 16.08.22 to 23.12.22		
Paper- DSE-1A/DSE-2A,GE-1,SEC-3		Full Marks: 75,75,50 Credit: 6,6,2		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	DSE-1A/DSE-2A রবীন্দ্রনাথ	40	Dr.Monua Panja	
2	GE-1 শিশু সাহিত্য ও গোয়েন্দা কাহিনি	40	Ashok Das	
3	SEC-3 শৈলী, কাব্যশৈলী বিচার, গদ্যশৈলী ও নাট্যশৈলী বিচার	30	Dr.Monua Panja	

(EVEN SEMESTER)

Semester II Hons		Period: 20.03.23 to 28.07.23		
Paper- C-3,C-4,GE-2		Full Marks: 75,75,75 Credit: 6,6,6		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	C-3 প্রাচীন ও মধ্য যুগের পদ পাঠ	40	Dr.Monua Panja	
2	C-4 চৈতন্য জীবনী ও মঙ্গলকাব্য সাহিত্য পাঠ	40	Ashok Das	
3	GE-2 কাব্য সাহিত্যের ধারা ও বৈষ্ণব পদাবলী পাঠ	40	Ashok Das	

Semester II General		Period: 20.03.23 to 28.07.23		
Paper- DSC-1B/DSC-2B, AECC MIL-1		Full Marks: 75,75 Credit: 6, 6		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	DSC-1B/DSC-2B কাব্য-কবিতা	40	Dr.Monua Panja	
2	AECC MIL-1 কবিতা ও ছোটগল্প	40	Dr.Monua Panja	

Semester IV Hons		Period: 28.02.23 to 08.07.23		
Paper- C-8,C-9,C-10,SEC-2,GE-4		Full Marks: 75,75,75,50,75 Credit: 6,6,6,2,6		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	C-8 উনিশ-বিশ শতকের প্রবন্ধ ও কাব্য সাহিত্যের ইতিহাস এবং আখ্যান সাহিত্য পাঠ	40	Ashok Das	
2	C-9 কাব্য পাঠ	40	Ashok Das	
3	C-10 উপন্যাস পাঠ	40	Dr.Monua Panja	
4	SEC-2 বাংলা ভাষা ও সাহিত্য বিষয়ক প্রকল্প রচনা ও প্রকল্প উপস্থাপনা	30	Dr.Monua Panja	
5	GE-4 বাংলা গীতি সাহিত্য, শিশু সাহিত্য ও রম্য রচনার ধারা	40	Ashok Das	

Semester IV General		Period: 28.07.23 to 28.07.23		
Paper- DSC-1D/DSC-2D,SEC-2,AECC		Full Marks: 75,50,75 Credit: 6,2,6		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	DSC-1D/DSC-2D সাহিত্য তত্ত্ব ও সাহিত্য নির্মাণ কলা	40	Dr.Monua Panja	
2	SEC-2 বাংলা ধ্বনি তত্ত্ব ও রূপ তত্ত্ব	30	Dr.Monua Panja	
3	AECC Bengali-2 উনিশ শতকের বাংলা প্রবন্ধ ও লোকসাহিত্য	40	Dr.Monua Panja	

Semester VI Hons		Period: 06.02.23 to 14.06.23		
Paper- C-13,C-14,DSE-3,DSE-4		Full Marks:75,75,75,75 Credit: 6,6,6,6		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	C-13 লোকসাহিত্য	40	Dr.Monua Panja	
2	C-14 সংস্কৃত, ইংরেজি ও প্রতিবেশী সাহিত্যের ইতিহাস	40	Ashok Das	
3	DSE-3 গদ্য সাহিত্য পাঠ	40	Dr.Monua Panja	
4	DSE-4 রবীন্দ্র সাহিত্য পাঠ	40	Ashok Das	

Semester VI General		Period: 06.02.23 to 14.06.23		
Paper-DSE-1B/DSE-2B,GE-2,SEC-4		Full Marks: 75,75,50 Credit: 6,6,2		
Sl. No.	PAPER	CLASSES ALLOTTED	Class taken by	Remark
1	DSE-1B/DSE-2B উপন্যাস ও ছোটগল্প	40	Dr.Monua Panja	
2	GE-2 প্রবন্ধ ও সাহিত্যের রূপরীতি-বিচার পদ্ধতি	40	Ashok Das	
3	SEC-4 বিষয় ভিত্তিক আলোচনা ও আলোচনাপত্র উপস্থাপন	30	Dr.Monua Panja	

Teaching Plan (EVEN SEMESTER)**(English Honours; CBCS)**

Semester II (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC 3 British Drama and Prose (Renaissance to 18 th century)		Full Marks: 75 Credit:06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	British Drama and Prose	40	Saranya Mukherjee	

Semester II (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC 4 (: British Literature: Romantic Period) (Theory)		Full Marks: 75 Credit:06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
2	British Literature : Romantic Period	40	Dr.Md Ataur Rahaman	

Semester II (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: GE 2 Gender and Human Rights		Full Marks: 75 Credit:06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
3	Gender and Human Rights	40	Saranya Mukherjee	

Teaching Plan (EVEN SEMESTER)**(English Honours; CBCS)**

Semester IV (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC8 European Classical Literature) (Theory)		Full Marks: 75 Credit:06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark

1	European Classical Literature	40	Saranya Mukherjee	
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Semester IV (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC9(Modern European Drama) (Theory)		Full Marks: 75		Credit:06
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
2	Modern European Drama	40	Dr.Md Ataur Rahaman	

Semester IV (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC10 (Popular literature) (Theory)		Full Marks: 75		Credit:06
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
3/A	Popular Literature(Topic: Funny Boy, Abol Tabol)	20	Saranya Mukherjee	
3/B	Popular Literature(Topic: Through the Looking Glass, The Murder of Roger Ackroyd)	20	Dr.Md Ataur Rahaman	

Semester IV (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: SEC2 Business Communication) (Theory)		Full Marks: 50 Credit:02		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
4	Business Communication	40	Saranya Mukherjee	

**Teaching Plan (EVEN SEMESTER)
(English GE CBCS)**

Semester IV (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: GE4(Environment and Literature) (Theory)		Full Marks: 75 Credit:06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
5	Environment and Literature	40	Dr.Md Ataur Rahaman	

**Teaching Plan (EVEN SEMESTER)
(English Honours; CBCS)**

Semester VI (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC13 T :Indian classical Literature) (Theory)		Full Marks: 75 Credit:06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1/A	Indian Classical Literature: Abhijnana Shakuntalam and Vyasa's The Dicing....The Temptation of Karna, Book V)	26	Saranya Mukherjee	

1/B	Sudraka's 'Mrcchakatika'	14	Dr.Md Ataur Rahaman	
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Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC14T Indian Writing in English) (Theory)		Full Marks: 75 Credit:06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
2/A	Poetry and fiction	26	Dr.Md Ataur Rahaman	
2/B	Drama	14	Saranya Mukherjee	

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE3 (Science Fiction and Detective Literature) (Theory)		Full Marks: 75 Credit:06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
3	Science Fiction and Detective Literature	40	Saranya Mukherjee	

Semester VI (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: DSE4 (Partition Literature) (Theory)		Full Marks: 75		Credit:06
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
4	Partition Literature	40	Dr.Md Aaur Rahaman	

Curriculum Plan (ODD SEMESTER)

(English Honours; CBCS)

Semester I (AY 2022-2023)		Period :July,2022 to Jan 2023		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	CORE 1T: British Poetry and Drama:Beginning to 14 th C and History of Eng Language F.M: 75, Credit : 06	40	Saranya Mukherjee	
2	CORE 2T: British Poetry and Drama: Renaissance to 17 th and 18 th centuries, F.M. 75, Credit: 06	40	Dr. Md Aaur Rahaman	
3.	AECC Elective, F.M. 50, Credit : 02	20	Dr. Md Aaur Rahaman	
4.	AECC Core, F.M. 50, Credit:02	20	c	
5.	GE-1 Academic Writing and Composition, F.M.-75, Credit 06	40	Dr. Md Aaur Rahaman	
Semester III (AY 2022-2023)		Period July,2023 to January,2023		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	CC 5T: British Literature 19 th Century	40	Dr. Md Aaur Rahaman	
2	CC6T:British Literature : Early 20 th Century: Poetry Section:	20	Dr. Md Aaur Rahaman	
3	CC6T:British Literature : Early 20 th Century: Fiction	20	Saranya Mukherjee	
Semester III (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: GE 3 T Contemporary India: Women and Empowerment		Full Marks: 75 Credit:06		

	Paper/Topic	CLASSES	Class	Remark
		ALLOTTED	taken by	
4	GE 3 T Contemporary India: Women and Empowerment	40	Saranya Mukherjee	
5	SEC: 1: Soft Skills, F.M. 50, Credit : 02	20	Dr. Md Ataur Rahaman	

<p>Curriculum Plan (ODD SEMESTER)</p> <p>(English Honours; CBCS)</p>

Semester V (AY 2023-2024)		Period Feb,2023 to July,2023		
Sl. No.	Paper/Topic :Theory	CLASSES ALLOTTED	Class taken by	Remark
1	CORE 11T:Postcolonial Literature, F.M.75, Credit: 06	40	Saranya Mukherjee	
Semester V (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CORE 12T Women's Writing) (Theory)		Full Marks: 75 Credit:06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
2	Women's Writing	40	Dr. Md Ataur Rahaman	
Semester V (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: DSE 1T (19th Century European Realism) (Theory)		Full Marks: 75 Credit:06		

Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
3/A	Crime and Punishment	20	Saranya Mukherjee	
3/B	Madam Bovary	20	Dr Md Ataur Rahaman	
Semester V (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper:DSE:2T (World Literatures) (Theory)		Full Marks: 75 Credit:06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
4/A	Bend in the River by Naipal	20	Saranya Mukherjee	
4/B	Blow up, Bora Ring	20	Dr. Md Ataur Rahaman	

Curriculum Plan (Even SEMESTER)
(English Gen; CBCS)

Semester II (AY 2023-2024)		Period: Feb,2023 to July,2023		
Core 3(DSC 1B): Essay, Drama and Novel		F.M.75, Credit 06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Core-3 (DSC-1B) : Essay, Drama	15	Dr.Md Ataur Rahaman	
2	Core-3(DSC- 1B) : Novel	10	Saranya Mukherjee	

Curriculum Plan (Even SEMESTER)
(English Gen; CBCS)

Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
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Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Core-7 (DSC-1D) Academic Writing and Composition : Theory (F.M.75, Credit 06)	20	Dr.Md Ataur Rahaman	
2	SEC- 2 : Technical Writing (F.M.50, Credit 02)	16	Saranya Mukherjee	

Curriculum Plan (Even SEMESTER)
(English Gen; CBCS)

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE-1B / 2B (Modern Europe) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	DSE : 2 :Partition Literature (Theory) FM.75, Credit 06	25	Dr.Md Ataur Rahaman	
2	GE- 2 : Environment and Literature (Theory) F.M.75, Credit 06	16	Dr.Md Ataur Rahaman	
3	SEC- 4: Business Communication , (F.m.50, Credit 02)	16	Saranya Mukherjee	

Teaching Plan (Odd SEMESTER)
(English Gen; CBCS)

Semester I (AY 2023-2024)		Period: July,2022 to Jan, 2023		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Core-1(DSC-A)/Core-2 (DSC-2A) Poetry and Short Story. F.M.-75, Credit-06	25	Saranya Mukherjee	
2	AECC-1(Language Core) F.M.-75, Credit-06	16	Dr. Md Ataur Rahaman	
3	AECC-1(Elective)) F.M.-75, Credit-06	10	Dr. Md Ataur Rahaman	

Teaching Plan (Odd SEMESTER)
(English Gen; CBCS)

Semester III (AY 2023-2024)		Period : July,2022 to Jan, 2023		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	DSC-1C Contemporary India: Women and Empowerment (F.M.75, Credit 06)	30	Saranya Mukherjee	
2.	SEC- 1 Soft Skills (F.M. 50/ Credit: 02)	15	Dr. Md Ataur Rahaman	
3.	AECC-3(Language Core) (F.M.75, Credit 06)	20	Dr. Md Ataur Rahaman	

Teaching Plan (Odd SEMESTER)
(English Gen; CBCS)

Semester V (AY 2023-2024)		Period: July,2022 to Jan, 2023		

Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	DSE 1-A British Literature F.M.75, Credit-06	25	Saranya Mukherjee	
2	GE- 1 Academic Writing and Composition F.M.75, Credit 06	16	Dr.Md Ataur Rahaman	
3	SEC- 3 : English Language Teaching F.M.50, Credit 02	16	Dr. Md Ataur Rahaman	

Curriculum Plan (ODD SEMESTER)

(Santali Honours; CBCS)

Semester I (AY 2022-2023)		Period: 19 September,2022 to 4 th February 2023		
Paper: CC1T (History of Santali Literature, Ancient Literature Before 1845 A.D.) (Theory)		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Origin of Santali Literature.	40	Shyamali Majhi	
Semester I(AY 2022-2023)		Period: 19 September,2022 to 4 th February 2023		
Paper: CC2T (Austic Language Family & Santali) (Theory)		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Origin and Development of Santali Language.	40	Dr. Shila Baske	

Curriculum Plan (ODD SEMESTER)

(Santali General; CBCS)

Semester I (AY 2022-2023)		Period: 19 September,2022 to 4 th February 2023		
Paper – DSC-1A History of Santali Literature (Theory)		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	History of Santali Literature, Ancient Santali Literature, Medieval Santali Literature, Modern Santali Literature, Origin of Santali Language & Its Character.	8	Dr. Shila Baske	
2	Important Author	8	Shyamali Majhi	
3	Important Books	8	Shyamali Majhi	
4	Magazines & Journals	8	Dr. Shila Baske	
5	Missions & Missionaries.	8	Dr. Shila Baske	

Curriculum Plan (ODD SEMESTER)

(Santali Honours; CBCS)

Semester III (AY 2022-2023)		Period: 9 th September, 2022 to 21 st January		
Paper CC5T: Functional Grammar of Santali Language (Theory)		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Paper CC5: Functional Grammar of Santali Language	40	Shila Baske	

Semester III (AY 2022-2023)		Period: 9 th September, 2022 to 21 st January		
Paper CC6T: Santali Folk Literature & Culture-2 (Theory)		Full Marks: 75 Credit:6		
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Paper CC6: Santali Folk Literature & Culture-2	40	Dr. Shila Baske	

Semester III (AY 2022-2023)		Period: 9 th September, 2022 to 21 st January		
Paper CC7: History of Santali Modern Literature (Theory)		Full Marks: 75 Credit:6		
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Paper CC7: History of Santali Modern Literature	40	Shyamali Majhi	

Semester III (AY 2022-2023)		Period: 9 th September, 2022 to 21 st January		
Paper SEC1: Creative Writing (Theory)		Full Marks: 50 Credit:2		
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	SEC1: Creative Writing	35	Shyamali Majhi	

Curriculum Plan (ODD SEMESTER)
(Santali General; CBCS)

Semester III (AY 2022-2023)		Period: 9 th September, 2022 to 21 st January		
Paper : DSC1C: Drama Literature (Theory)		Full Marks:75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Drama i. Darege Dhon, ii. Bir Birsha,	15	Shyamali Majhi	
2	Drama i. Lo Bir, ii. Sidhu Kanhu Hool,	15	Dr. Shila Baske	
3	i. Koche karba, ii. Maya Sutam (one act play)	5	Shyamali Majhi	
4	i. Sirjin (one act play)	5	Dr. Shila Baske	
Semester III (AY 2022-2023)		Period: 9 th September, 2022 to 21 st January		
SEC1: Creative Writing (Theory)		Full Marks: 50		Credit:2
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Creative Writing - Creative Writing, Art and Craft of writing, Models of Creative writing	17	Dr. Shila Baske	
2	Creative Writing – Writing of media, preparing for publication.	17	Shyamali Majhi	

Curriculum Plan (ODD SEMESTER)
(Santali Honours; CBCS)

Semester V (AY 2022-2023)		Period: 16 th August, 2022 to 23 rd December		
CC11: Novel & Short Story (Theory)		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	CC11: Novel & Short Story	40	Shyamali Majhi	

Semester V (AY 2022-2023)		Period: 16 th August, 2022 to 23 rd December		
CC 12: Poetry Literature (Theory)		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	CC 12: Poetry Literature	40	Dr. Shila Baske	

Semester V (AY 2022-2023)		Period: 16 th August, 2022 to 23 rd December		
Paper: DSE1: Decretive study of Santali Language (Theory)		Full Marks: 75		Credit:6
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	DSE1: Decretive study of Santali Language	40	Shyamali Majhi	

Semester V (AY 2022-2023)		Period: 16 th August, 2022 to 23 rd December		
DSE2: Poem & Poetry of Literature (From 1950 to Till Now) (Theory)		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	DSE2: Poem & Poetry of Literature (From 1950 to Till Now)	40	Dr.Shila Baske	

Curriculum Plan (EVEN SEMESTER)
(Santali Honours; CBCS)

Semester II (AY 2022-2023)		Period: 20 TH March, 2023 to 28 th July, 2023		
Paper: CC3T (Paper CC3: Santali folk literature-1) (Theory)		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Paper CC3: Santali folk literature-1	40	Shyamali Majhi	

Semester II (AY 2022-2023)		Period: 20 TH March, 2023 to 28 th July, 2023		
Paper CC4 :History of Santali literature (Medieval period: 1845 – 1947)(Theory)		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Paper CC4 :History of Santali literature (Medieval period: 1845 – 1947)	40	Dr.Shila Baske	

Curriculum Plan (EVEN SEMESTER)
(Santali General; CBCS)

Semester II (AY 2022-2023)		Period: 20 TH March, 2023 to 28 th July, 2023		
Paper: DSC-1B: Santali Poetry Literature, Folk Song (Theory)		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Santali Poetry	20	Dr. Shila Baske	
2	Folk Song	20	Shyamali Majhi	

Curriculum Plan (EVEN SEMESTER)
(Santali Honours; CBCS)

Semester IV(AY 2022-2023)		Period: 28 th February, 2023 to 8 th July, 2023		
Paper: Paper CC8: Language & Santali Linguistic (Theory)		Full Marks: 75		Credit: 6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Paper CC8: Language & Santali Linguistic	40	Dr.Shila Baske	

Semester IV(AY 2022-2023)		Period: 28 th February, 2023 to 8 th July, 2023		
Paper: CC9T: Comparative Study Tribal Literature & Others (Theory)		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	CC9: Comparative Study Tribal Literature & Others	40	Dr.Shila Baske	

Semester IV(AY 2022-2023)		Period: 28 th February, 2023 to 8 th July, 2023		
Paper : CC10 Theory of Literature		Full Marks: 75		Credit:6
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Paper CC10 Theory of Literature	40	Shyamali Majhi	

Semester IV(AY 2022-2023)		Period: 28 th February, 2023 to 8 th July, 2023		
Paper: SEC2: Santali Language Teaching		Full Marks: 50		Credit:2
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	SEC2: Santali Language Teaching	35	Shyamali Majhi	

Curriculum Plan (EVEN SEMESTER)
(Santali General; CBCS)

Semester IV(AY 2022-2023)		Period: 28 th February, 2023 to 8 th July, 2023		
Paper: DSC1D: Santali Novel & Short story		Full Marks: 75		Credit:6
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Santali Novel - Harmawak auto, Kash dungri, Short story – Hirom sikir, Mama Orag.	20	Shyamali Majhi	
2	Santali Novel - Auto Orak, Upal, Matimay, Short story – Baj Mudam, Khuni Matkom.	20	Dr. Shila Baske	

Semester IV (AY 2022-2023)		Period: 28 th February, 2023 to 8 th July, 2023		
Paper: SEC2: Santali Language Teaching		Full Marks: 50 Credit:2		
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Knowing the Learner, structure of Santali Language, Method of Teaching Santali Language.	17	Dr. Shila Baske	
2	Materials for Language Teaching, Assessing Language Skills.	17	Shyamali Majhi	

Curriculum Plan (EVEN SEMESTER)
(Santali Honours; CBCS)

Semester VI (AY 2022-2023)		Period: 6 th February, 2023 to 14 th June, 2023		
Paper: CC13: Drama & Essay Literature		Full Marks: 75 Credit:6		
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	CC13: Drama & Essay Literature	40	Shyamali Majhi	

Semester VI (AY 2022-2023)		Period: 6 th February, 2023 to 14 th June, 2023		
Paper: CC14: Santali Magazine & Journal, Bengali Literature		Full Marks: 75 Credit:6		
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	CC14: Santali Magazine & Journal, Bengali Literature	40	Dr. Shila Baske	

Semester VI (AY 2022-2023)		Period: 6 th February, 2023 to 14 th June, 2023		
Paper: DSE3: Prose Literature (from 1936 to 1980)		Full Marks: 75 Credit:6		
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	DSE3: Prose Literature (from 1936 to 1980)	40	Shyamali Majhi	

Semester VI (AY 2022-2023)		Period: 6 th February, 2023 to 14 th June, 2023		
Paper: DSE4 Project Work		Full Marks: Credit:		
Sl. No.	PAPER/ TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	DSE4: Project Work	40	Dr. Shila Baske	

Curriculum Plan (EVEN SEMESTER)**(History Honours; CBCS)**

Semester II (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC 3T (Mauryan and Gupta Empire) (Theory)		Full Marks:		Credit:
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Mauryan and Gupta Empire	40	Alauddin Seikh	

Semester II (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC 4T (: Political History of Early Medieval India (600 AD to 1200 AD) (Theory)		Full Marks:		Credit:
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Political History of Early Medieval India (600 AD to 1200 AD	40	Inder Mukherjee	

Semester II (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: GE 2 T Science and Empire		Full Marks:		Credit:
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Science and Empire	40	Inder Mukherjee	

**Curriculum Plan (EVEN SEMESTER)
(History Honours; CBCS)**

Semester IV (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC8T (Renaissance and reformation) (Theory)		Full Marks:		Credit:
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Renaissance and reformation	40	Alauddin Seikh	

Semester IV (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC9T (The French Revolution & Nepoleon Bonaparte) (Theory)		Full Marks:		Credit:
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	The French Revolution & Nepoleon Bonaparte	40	Inder Mukherjee	

Semester IV (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC10T (19th Century Revolutions in Europe) (Theory)		Full Marks:		Credit:
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	19th Century Revolutions in Europe	40	Alauddin Seikh	

Semester IV (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: SEC2T (Colonial Science in India: Institutions and Practices) (Theory)		Full Marks:		Credit:
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Colonial Science in India: Institutions and Practices	40	Inder Mukherjee	

**Curriculum Plan (EVEN SEMESTER)
(History GE CBCS)**

Semester IV (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: GE4T (History of Indian Journalism) (Theory)		Full Marks:		Credit:
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	History of Indian Journalism	40	Alauddin Seikh	

**Curriculum Plan (EVEN SEMESTER)
(History Honours; CBCS)**

Semester VI (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: CC13T (International Relations after the Second World War) (Theory)		Full Marks:		Credit:
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	International Relations after the Second World War	40	Alauddin Seikh	

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC14T (Modern Nationalism in India) (Theory)		Full Marks:		Credit:
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Modern Nationalism in India	40	Alauddin Seikh	

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE3 (The Russian Revolution) (Theory)		Full Marks:		Credit:
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	The Russian Revolution	40	Inder Mukherjee	

Semester VI (AY 2023-2024)		Period Feb,2023 to July,2023		
Paper: DSE4 (Pre-colonial South East Asia) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Pre-colonial South East Asia	40	Inder Mukherjee	

Curriculum Plan (ODD SEMESTER)
(History Honours; CBCS)

Semester I (AY 2022-2023)		Period July,2022 to Jan, 2023		
Paper: CC 1T (CT1: Greek and Roman Historians) (Theory)		Full Marks: 75		Credit: 06
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	New form of inquiry (historia) in Greece in the sixth century BCE	03	Inder Mukherjee	
2	Herodotus and his Histories	03	Inder Mukherjee	
3	Thucydides: the founder of scientific history writing	03	Inder Mukherjee	
4	Next generation of Greek historians	03	Inder Mukherjee	
5	Development of Roman Historiographical tradition	03	Inder Mukherjee	
6	Imperial historians	03	Inder Mukherjee	
7	Historical methods in ancient Rome	04	Inder Mukherjee	

Semester I GE (AY 2022-2023)		Period July,2022 to Jan, 2023		
Paper: GE (Theories of the Modern State)		Full Marks: 75		Credit: 06
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	The State Definitions and Elementary Concepts	03	Inder Mukherjee	
2	The Absolutist State	03	Inder Mukherjee	
3	The Liberal State	03	Inder Mukherjee	
4	The Liberal State	03	Inder Mukherjee	
5	The state and class Marxist perspective	03	Inder Mukherjee	
6	The ideological basis of the Welfare State and its comparison with Communism	03	Inder Mukherjee	

Semester I (AY 2022-2023)		Period July,2022 to Jan, 2023		
Paper: CC 2T (Early Historic India (proto history to 6th century B.C) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Understanding early India	03	Alauddin Seikh	
2	Neolithic to Chalcolithic settlements	03	Alauddin Seikh	
3	The Aryans in India: Vedic Age	03	Alauddin Seikh	
4	North India in sixth century BCE	03	Alauddin Seikh	
5	Ideas and institutions in early India	03	Alauddin Seikh	
6	Cults, doctrines and metaphysics	04	Alauddin Seikh	
7	Aspects of economy in the age of Buddha	03	Alauddin Seikh	
8	The cultural milieu	03	Alauddin Seikh	

Curriculum Plan (ODD SEMESTER)
(History Honours; CBCS)

Semester III (AY 2023-2024)		Period July,2022 to Jan, 2023		
Paper: CC5T (Delhi Sultanate) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Interpreting the Delhi Sultanate – A Survey of Sources:	05	Alauddin Seikh	
2	Foundation, Consolidation and Challenges to the Delhi Sultanate	05	Alauddin Seikh	
3	Emergence of Regional States: Vijayanagara, Bahmani Kingdom, Bengal	05	Alauddin Seikh	
4	Society and Economy	05	Alauddin Seikh	
5	Religion, Society and Culture	05	Alauddin	

			Seikh	
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Semester III (AY 2023-2024)		Period July,2022 to Jan, 2023		
Paper: CC6T (The Feudal Society) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Muhammad and Charlemagne	05	Alauddin Seikh	
2	Europe besieged	05	Alauddin Seikh	
3	Feudal Society and Economy (c.800—c.1100)	05	Alauddin Seikh	
4	Emergence of National Kingship:	05	Alauddin Seikh	
5	Religion and Culture	05	Alauddin Seikh	

Semester III (AY 2023-2024)		Period July,2022 to Jan, 2023		
Paper: CC7T (Akbar and the Making of Mughal India) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Sources and Historiography-	05	Alauddin Seikh	
2	Establishment of Mughal Rule in India	05	Alauddin Seikh	
3	Formation of Imperial authority & Consolidation under Akbar-Campaigns and Conquests	05	Alauddin Seikh	
4	Expansion and integration- Incorporation of Rajputs and other indigenous groups in Mughal nobility	05	Alauddin Seikh	
5	Rural Society and Economy	05	Alauddin Seikh	
6	Religion and Culture	05	Alauddin Seikh	

Semester III (AY 2022-2023)		Period July,2022 to Jan, 2023		
Paper: SEC1T (Literature and History: Bengal) (Theory)		Full Marks: 40	Credit: 02	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	History and Literature	02	Alauddin Seikh	
2	Dichotomy between Itihasa and History	02	Alauddin Seikh	
3	Novel as a new literary genre	02	Alauddin Seikh	
4	Power and Patriotism: Bankim's Nationalism	02	Alauddin Seikh	
5	Sarat Chandra Chattopadhyay and the Indian Women of Early 20th Century	02	Alauddin Seikh	
6	Narratives of Suffering	02	Alauddin Seikh	
7	SatinathBhaduri & the Gandhian Movement	02	Alauddin Seikh	

Curriculum Plan (ODD SEMESTER)
(History GE; CBCS)

Semester III (AY 2022-2023)		Period July,2022 to Jan, 2023		
Paper: GE3T (Some Perspectives on Women's Rights in India) (Theory)		Full Marks: 75	Credit: 06	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Definition of Human Rights	05	Alauddin Seikh	
2	Indian Constitution and Women's Rights	05	Alauddin Seikh	
3	Preventive Acts	05	Alauddin Seikh	
4	Issues of Violence against Women and Remedial Measures	05	Alauddin Seikh	
5	Role of Non-Government Institutions	05	Alauddin Seikh	
6	Present Status	05	Alauddin	

			Seikh	
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Curriculum Plan (History Honours; CBCS)

Semester V (AY 2023-2024)		Period July,2022 to Jan, 2023		
Paper: CC11T (Select Themes in the Colonial Impact on Indian Economy and Society) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Colonial State institutions and ideologies:	05	Inder Mukherjee	
2	Land Settlements and agricultural change	05	Inder Mukherjee	
3	Modern Industrialisation	05	Inder Mukherjee	
4	Census and Caste	05	Inder Mukherjee	
5	Reformism and Revivalism	05	Inder Mukherjee	
6	Islamic reform in India	05	Inder Mukherjee	

Semester V (AY 2023-2024)		Period July,2022 to Jan, 2023		
Paper: CC12T (Peasant and Tribal Uprisings in Colonial India in the 19th Century) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	The Early 19th century	15	Inder Mukherjee	
2	The Late 19th century	15	Inder Mukherjee	

Semester V (AY 2023-2024)		Period July,2022 to Jan, 2023		
Paper: DSE1 (Modern Transformation of China (1839-1949) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Pre-colonial China	05	Inder Mukherjee	
2	Foreign Contact and Anglo-Chinese Relations	05	Inder Mukherjee	
3	Rebellion and Restoration	05	Inder Mukherjee	
4	Movements, Reform and Restoration in China	05	Inder Mukherjee	
5	Formation of Communist Republics in China	05	Inder Mukherjee	

Semester V (AY 2023-2024)		Period July,2022 to Jan, 2023		
Paper: DSE2 (Modern Transformation of Japan) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Pre-Meiji Japan	05	Inder Mukherjee	
2	Meiji Restoration	05	Inder Mukherjee	
3	Popular and Democratic Movements:	05	Inder Mukherjee	
4	Emergence of Japan as an Imperial	05	Inder	

	Power		Mukherjee	
5	Japan through the two World Wars	05	Inder Mukherjee	

**Curriculum Plan (Even SEMESTER)
(History Gen; CBCS)**

Semester II (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: Core-3 (DSC-1B) or Core-4 (DSC-2B (Medieval India) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Medieval India	25	Alauddin Seikh	

**Curriculum Plan (Even SEMESTER)
(History Gen; CBCS)**

Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: Core-7 (DSC-1D) or Core-8 (DSC-2D) (Modern nationalism in India) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Modern nationalism in India	25	Alauddin Seikh	
SEC-2 (FM-40, Credit-02)	SEC- 2 : Literature and History: Bengal	16	Alauddin Seikh	

**Curriculum Plan (Even SEMESTER)
(History Gen; CBCS)**

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE-1B / 2B (Modern Europe) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Modern Europe	25	Inder Mukherjee	
GE- 2 (FM-75, Credit-06)	GE- 2 : Some Perspectives on Women's Rights in India	16	Alauddin Seikh	
SEC- 4 (FM-40, Credit-02)	SEC- 4: Art Appreciation An introduction to Indian art	16	Inder Mukherjee	

Curriculum Plan (Odd SEMESTER)
(History Gen; CBCS)

Semester I (AY 2023-2024)		Period: July,2022 to Jan, 2023		
Paper: Core-1 (DSC-1A) / Core-2 (DSC-2A) (Ancient India) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Ancient India	25	Inder Mukherjee	

Curriculum Plan (Even SEMESTER)
(History Gen; CBCS)

Semester III (AY 2023-2024)		Period : July,2022 to Jan, 2023		
Paper: Core-5 (DSC-1C / Core-6 (DSC-2C) (Selected themes in the Colonial impact on Indian Economy and Society) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Selected themes in the Colonial impact on Indian Economy and Societ	25	Alauddin Seikh	
SEC-1 (FM-40, Credit-02)	SEC- 1 : The Making of Indian Foreign Policy	16	Alauddin Seikh	

Curriculum Plan (Even SEMESTER)
(History Gen; CBCS)

Semester VI (AY 2023-2024)		Period: July,2022 to Jan, 2023		
Paper: DSE-1A / 2A(Renaissance and Reformation) (Theory)		Full Marks: 75 Credit: 06		
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Renaissance and Reformation	25	Inder Mukherjee	
GE- 1 (FM-75, Credit-06)	GE- 1 : Science and Empire	16	Alauddin Seikh	
SEC- 3 (FM-40, Credit-02)	SEC- 3 : Colonial Science in India: Institutions and Practices	16	Inder Mukherjee	

Government General Degree College, Keshiary

Department of Political Science

Curriculum Plan 2023-24

Political Science Hons. (2nd, 4th, 6th Semester)

Semester	Paper	Unit	No. of Lectures	To be completed By
2 nd Semester	MAJOR -2	Unit 1-4	12	1-3 rd Month
		Internal Examination		
		Unit 5-8	12	4-5 th Month
		Revision and preparation for University examination		
	SEC-2	FIELD SURVEY ON MEDIA & POLITICS AND ITS PROJECT REPORT		5-6 th Month
	MINOR-2 (Students from other Discipline)	Unit 1, 2 & 3, 4	12	1-3 rd Month
		Internal Examination		
		Unit 5, 6, 7, 8	12	4-5 th Month
		Revision and preparation for the University examination		
	MDC-2 (Students from all disciplines)	Unit 1, 2, 3	12	1-3 rd Month
		Internal Examination		
		Unit 4 & 5	10	4-5 th Month
Revision and preparation for the University examination			6 th Month	
4 th Semester	CC-8	Unit 1, 2 & 3	12	1-3 rd Month
		Internal Examination		
		Unit 4, 5, & 6	12	4-5 th Month
		Revision and preparation for University examination		
	CC-9	Unit 1, 2 & 3	12	1-3 rd Month
		Internal Examination		
		Unit 4 & 5	10	4-5 th Month
		Revision and preparation for University examination		
	CC10	Unit 1 & 2	10	1-3 rd Month

4 th Semester		Internal Examination		
		Unit 3	4	4-5 th Month
		Revision and preparation for University examination		6 th Month
	SEC-2	Unit 1, 2, & 3	10	1-3 rd Month
		Internal Examination		
		Unit 4 & 5	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	GE-4 (Students from other Discipline)	Unit 1 & 2	10	1-3 rd Month
		Internal Examination		
		Unit 3	03	4-5 th Month
Revision and preparation for University examination		6 th Month		
6 th Semester	CC-13	Unit 1 & 2	12	1-3 rd Month
		Internal Examination		
		Unit 3 & 4	12	4-5 th Month
		Revision and preparation for University examination		6 th Month
	CC-14	Unit 1, 2, 3, 4, 5 & 6	12	1-3 rd Month
		Internal Examination		
		Unit 7, 8, 9, 10, 11 & 12	12	4-5 th Month
		Revision and preparation for University examination		6 th Month
	DSE-3	Unit 1	10	1-3 rd Month
		Internal Examination		
		Unit 2	10	4-5 th Month
		Revision and preparation for the University examination		6 th Month
	DSE-4	FIELD SURVEY AND PROJECT WORK		5-6 th Month

Government General Degree College, Keshiary

Department of Political Science

Curriculum Plan 2023-24

Political Science Hons. (1st, 3rd, 5th Semester)

Semester	Paper	Unit	No. of Lectures	To be completed By
1 st Semester	MAJOR -1	Unit 1	12	1-3 rd Month
		Internal Examination		
		Unit 2	12	4-5 th Month
		Revision and preparation for University examination		
	SEC-1	FIELD SURVEY ON PANCHAYATI RAJ MANAGEMENT SYSTEM & PROJECT REPORT		5 th -6 th Month
	MINOR-1 (Students from other Discipline)	Unit 1, 2, 3 & 4	12	1-3 rd Month
		Internal Examination		
		Unit 5, 6, 7& 8	12	4-5 th Month
		Revision and preparation for the University examination		
	MDC-1 (Students from all disciplines)	Unit 1, 2	12	1-3 rd Month
		Internal Examination		
		Unit 3	10	4-5 th Month
Revision and preparation for the University examination			6 th Month	
3 rd Semester	CC-5	Unit 1 & Unit 2	10	1-3 rd Month
		Internal Examination		
		Unit 3	8	4-5 th Month
		Revision and preparation for University examination		
	CC6	Unit 1 & Unit 2	10	1-3 rd Month
		Internal Examination		
		Unit 3 & 4	10	4-5 th Month
		Revision and preparation for University examination		
	CC7	Unit 1 & 2	10	1-3 rd Month
		Internal Examination		
		Unit 3	10	4-5 th Month
		Revision and preparation for the University examination		
	SEC-1	Unit 1, 2, & 3	10	1-3 rd Month
		Internal Examination		

3 rd Semester		Unit 4 & 5	10	4-5 th Month
		Revision and preparation for the University examination		6 th Month
	GE-3 (Students from other Discipline)	Unit 1 & 2	10	1-3 rd Month
		Internal Examination		
		Unit 3 & 4	10	4-5 th Month
		Revision and preparation for the University examination		6 th Month
5 th Semester	CC11	Unit 1 & 2	12	1-3 rd Month
		Internal Examination		
		Unit 3 & 4	12	4-5 th Month
		Revision and preparation for University examination		6 th Month
	CC12	Unit 1, 2, 3	10	1-3 rd Month
		Internal Examination		
		Unit 4, 5, 6	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	DSE-1	Unit 1, 2, 3	10	1-3 rd Month
		Internal Examination		
		Unit 4, 5, 6	10	4-5 th Month
		Revision and preparation for the University examination		6 th Month
	DSE-2	Unit 1, 2	10	1-3 rd Month
		Internal Examination		
		Unit 3	10	4-5 th Month
		Revision and preparation for the University examination		6 th Month

Government General Degree College, Keshiary

Department of Political Science

Curriculum Plan 2022-23

Political Science Hons. (2nd, 4th, 6th Semester)

Semester	Paper	Unit	No. of Lectures	To be completed By
2 nd Semester	CC-3	Unit 1 & 2	12	1-3 rd Month
		Internal Examination		
		Unit 3 & 4	12	4-5 th Month
		Revision and preparation for University examination		6 th Month
	CC-4	Unit 1, 2, 3 & 4	14	1-3 rd Month
		Internal Examination		
		Unit 5, 6 & 7	12	4-5 th Month
		Revision and preparation for University examination		6 th Month
	GE-2 (Students from other Discipline)	Unit 1, 2 & 3	12	1-3 rd Month
		Revision and preparation for University examination		
		Unit 4 & 5	12	4-5 th Month
		Revision and preparation for University examination		6 th Month
4 th Semester	CC-8	Unit 1, 2 & 3	12	1-3 rd Month
		Internal Examination		
		Unit 4, 5, & 6	12	4-5 th Month
		Revision and preparation for University examination		6 th Month
	CC-9	Unit 1, 2 & 3	12	1-3 rd Month
		Internal Examination		
		Unit 4 & 5	10	4-5 th Month
		Revision and preparation for University examination		6 th Month

4 th Semester	CC10	Unit 1 & 2	10	1-3 rd Month
		Internal Examination		
		Unit 3	4	4-5 th Month
		Revision and preparation for University examination		6 th Month
	SEC-2	Unit 1, 2, & 3	10	1-3 rd Month
		Internal Examination		
		Unit 4 & 5	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	GE-4 (Students from other Discipline)	Unit 1 & 2	10	1-3 rd Month
		Internal Examination		
		Unit 3	03	4-5 th Month
		Revision and preparation for University examination		6 th Month
6 th Semester	CC-13	Unit 1 & 2	12	1-3 rd Month
		Internal Examination		
		Unit 3 & 4	12	4-5 th Month
		Revision and preparation for University examination		6 th Month
	CC-14	Unit 1, 2, 3, 4, 5 & 6	10	1-3 rd Month
		Internal Examination		
		Unit 7, 8, 9, 10, 11 & 12	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	DSE-3	Unit 1	10	1-3 rd Month
		Internal Examination		
		Unit 2	10	4-5 th Month
		Revision and preparation for the University examination		6 th Month
	DSE-4	FIELD SURVEY AND PROJECT WORK		5-6 th Month

Government General Degree College, Keshiary

Department of Political Science

Curriculum Plan 2023-24

Political Science General (1st, 3rd, 5th Semester)

Semester	Paper	Unit	No. of Lectures	To be completed By
1 st Semester	Major -A1 (Those who have taken Pol. Sc. As 1 st Subject)	Unit 1	12	1-3 rd Month
		Internal Examination		
		Unit 2	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	SEC-1	FIELD SURVEY ON PANCHAYATI RAJ MANAGEMENT SYSTEM & PROJECT REPORT		5- 6 th Month
	MDC-1 (Students from all Disciplines)	Unit 1, 2	12	1-3 rd Month
		Internal Examination		
		Unit 3	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	MINOR-C1 (Those who have taken Pol. Sc. As 3 rd Subject)	Unit 1	12	1-3 rd Month
		Internal Examination		
		Unit 2	10	4-5 th Month
Revision and preparation for University examination		6 th Month		
3 rd Semester	DSC-1C Or	Unit 1- 3	10	1-3 rd Month
		Internal Examination		
	DSC-2C	Unit 4-6	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	SEC-1	Unit 1-3	10	1-3 rd Month
		Internal Examination		
		Unit 4-5	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	DSE 1A	Unit 1 & 2	10	1-3 rd Month

5 th Semester	Or DSE 2A	Internal Examination		
		Unit 3	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	SEC-3	Unit 1, 2	12	1-3 rd Month
		Internal Examination		
		Unit 3	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	GE-1 (Students from other Discipline)	Unit 1-3	10	1-3 rd Month
		Internal Examination		
		Unit 4-5	10	4-5 th Month
		Revision and preparation for University examination		6 th Month

Government General Degree College, Keshiary

Department of Political Science

Curriculum Plan 2022-23

Political Science General (2nd, 4th, 6th Semester)

Semester	Paper	Unit	No. of Lectures	To be completed By
2 nd Semester	DSC-1B	Unit 1-4	12	1-3 rd Month
	OR	Internal Examination		
	DSC-2B	Unit 5-8	12	4-5 th Month
		Revision and preparation for University examination		6 th Month
4 th Semester	DSC-1D	Unit 1- 2	10	1-3 rd Month
	Or	Internal Examination		
	DSC-2D	Unit 3	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	SEC-2	Unit 1-3	10	1-3 rd Month
		Internal Examination		
		Unit 4-5	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
6 th Semester	DSE 1B	Unit 1 & 2	10	1-3 rd Month
	Or	Internal Examination		
	DSE 2B	Unit 3	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	SEC-4	Unit 1- 2	12	1-3 rd Month
		Internal Examination		
		Unit 3-4	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
6 th Semester	GE-2	Unit 1-2	12	

	(Students from other Discipline)	Internal Examination		1-3 rd Month
		Unit 3	06	4-5 th Month
		Revision and preparation for University examination		6 th Month

Government General Degree College, Keshiary
Department of Political Science
Curriculum Plan 2022-23
Political Science General (1st, 3rd, 5th Semester)

Semester	Paper	Unit	No. of Lectures	To be completed By
1 st Semester	DSC 1A Or DSC 2A	Unit 1-2	12	1-3 rd Month
		Internal Examination		
		Unit 3	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
3 rd Semester	DSC-1C Or DSC-2C	Unit 1- 3	10	1-3 rd Month
		Internal Examination		
		Unit 4-6	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	SEC-1	Unit 1-3	10	1-3 rd Month
		Internal Examination		
		Unit 4-5	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
5 th Semester	DSE 1A Or DSE 2A	Unit 1 & 2	10	1-3 rd Month
		Internal Examination		
		Unit 3	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
	SEC-3	Unit 1, 2	12	1-3 rd Month
		Internal Examination		
		Unit 3	10	4-5 th Month
		Revision and preparation for University examination		6 th Month
5 th Semester (Students from other Discipline)	GE-1	Unit 1-3	10	1-3 rd Month
		Internal Examination		
		Unit 4-5	10	4-5 th Month

		Revision and preparation for University examination	6 th Month
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Curriculum Plan (EVEN SEMESTER)
(ANTHROPOLOGY Honours; CBCS)

Semester II (AY 2023-2024)		Period:	to		
Paper: CC 3T (Archaeological Anthropology) (Theory)		Full Marks: 40	Credit: 04		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	Introduction to Archaeological Anthropology 1. Definition and scope of archaeological anthropology 2. Relation with other disciplines 3. Methods of studying archaeological anthropology	12	AS/SD		
2	Methods of Estimation of Time and Reconstruction of the Past 1. Absolute dating methods (c14, K-Ar, TL, Dendrochronology, Palaeomagnetism) 2. Relative dating methods (Stratigraphy, FUN estimation) 3. Methods of climatic reconstruction: palynology, paleontology, soil pH estimation.	12	AS		
3	Geochronology of Pleistocene Epoch 1. Glacial and Interglacial 2. Pluviation and Inter Pluviation 3. Different types of geoclimatic events	12	SD		
4	Understanding Culture 1. Technique of tool manufacture and estimation of their relative efficiency 2. Classification of tools: primary and combination fabrication techniques 3. Typology and cultural nomenclature 4. Palaeolithic, Mesolithic and Neolithic Culture of Europe and India.	12	SD		
5	Earliest Evidence of Culture in the World 1. Konso, Olorgesailie, Olduvai Gorge, Stellenbosch. 2. Pirro Nord, Dmanisi, Alpuerca, Patjitanian, Choukoutien, Anyathian. 3. Soan, Kortalayer Valley, Narmada, Bhimbetka.	12	AS		

Semester II (AY 2023-2024)		Period:	to		
Paper: CC 3P (Archaeological Anthropology (Lab)) (Practical)		Full Marks: 20	Credit: 02		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	Typo-technological Analysis of Prehistoric Tools Identification, Interpretation and Drawings of the tool Types 1. Core Tool Types – any three Chopper, Hand axe, Cleaver. 2. Flake Tool Types – any two Scrapers, Points. 3. Blade Tool Types – any two Knife, Blade, Burin. 4. Microlithic Tool Type – any two Triangle, Lunate, Trapeze. 5. Neolithic Tool Type – any two Axe, Adze, Chissel, Ringstone. 6. Bone Tools – Barbed Harpoon, Lance point, Baton-de-commandmen	12	AS/SD		

Semester II (AY 2023-2024)		Period: to		
Paper: CC 4T (Fundamentals of Human Origin and Evolution) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1 Primate origins and radiation with special reference to: Parapithecus, Ramapithecus, Dryopithecus, Sivapithecus and their distribution, features with their phylogenetic relationships	10	PR	
2	Unit 2 1. Australopithecines: distribution, features and their phylogenetic relationships. 2. Appearance of genus Homo (Homo habilis) and related finds.	10	PR	
3	Unit 3 The origin of Homo sapiens: Fossil evidences of Neanderthals and Archaic Homo sapiens	10	JRT	
4	Unit 4 The origin of Homo sapiens: Fossil evidences of Neanderthals and Archaic Homo sapiens	10	JRT	
5	Unit 5 Origin of anatomically modern humans (Homo sapiens sapiens): Distribution and features Brief outline of the models of human origin: Out-of-Africa and Replacement model	10	JRT	
6	Unit 6 Hominisation process, Biology and culture Co-evolution	10	PR	

Semester II (AY 2023-2024)		Period: to		
Paper: CC 4P (Fundamentals of Human Origin and Evolution (Lab)) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Craniometry a) Maximum Cranial length and breadth b) Maximum bizygomatic breadth c) Maximum frontal breadth d) Minimum frontal breadth e) Nasal height and breadth f) Bi-Mastoid Breadth g) Greatest occipital breadth h) Upper facial height i) Cranial index j) Nasal index	4	PR	
2	2. Osteometry: Measurements of long and flat bones: (Any three) Lengths, minimum/least circumference and caliber index	4	PR	
3	3. Identification of casts of fossils of family hominidae: Drawing and comparison of characteristics	4	JRT	

**Curriculum Plan (EVEN SEMESTER)
(ANTHROPOLOGY Honours; CBCS)**

Semester IV (AY 2023-2024)		Period: to		
Paper: CC8T (Theories of Culture and Society) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1 Emergence of Anthropology: Interface of Enlightenment with evolutionary Biology, Society and Colonialism. changing perspectives on Evolutionism, Diffusionism and Culture area theories	10	AS/SD	
2	Unit 2 Emergence of fieldwork tradition: Evolutionism, Diffusionism and Historical Particularism, American Cultural Tradition	10	SD	
3	Unit 3 Making Anthropology a Science: Durkheim and Social Solidarity, Functionalism, Structural-functionalism and British Social Anthropology. Concepts of Social Structure and Social Organization.	10	SD	
4	Unit 4 Anthropology's Cognitive Adventure: Structuralism	10	AS	
5	Unit 5 Symbolic and Interpretative approaches	10	AS	
6	Unit 6 Cultural Relativism and Ethnocentrism	10	AS	

Semester IV (AY 2023-2024)		Period: to		
Paper: CC8P (Theories of Culture and Society Lab) (Practical)		Full Marks: 20		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	List of Practical As a part of the practical following exercises will be undertaken by the students so as to enable them to connect the theories they learn with things of everyday living. 1. To identify a topic relating to contemporary issue and formulate research questions and clearly identify the theoretical perspectives from which they are derived. 2. Identification of variables of a study. 3. Various types of hypotheses. 4. Formulation of hypothesis. 5. Distinction between hypothesis testing and exploratory research. 6. Identification of universe and unit of study with justifications7. Choice of appropriate research technique and method in the context of theoretical framework. 8. Data collection and analysis	12	AS	

Semester IV (AY 2023-2024)		Period: _____ to _____		
Paper: CC9T (Human Growth and Development) (Theory)		Full Marks: 40 Credit: 04		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1 Concept of human growth, development, differentiation and maturation.	8	JRT	
2	Unit 2 Outlines of Prenatal and postnatal growth. Concepts of general growth curve (Scammon's growth curve), Concepts of Growth curve (Distance and acceleration). Ethnic and Sex differences in growth, Concept of secular trend	8	JRT	
3	Unit 3 Concept of Methodology of growth study: Longitudinal, Cross section and mixed longitudinal Concept of factors affecting growth: genetic, social, and ecological factors Significance/ applicability of growth studies (Outline)	8	JRT	
4	Unit 4 Nutritional epidemiology-concept of Food, Nutrition and Diet Concept of under nutrition and over nutrition with reference to Kwashiorkor Marasmus and obesity Concept of Stunting and Wasting Assessment of nutritional status (Outline of the utilization of Anthropometry)	8	PR	
5	Unit 5 Concept of Human physique and body composition – models and techniques; gender and ethnic differences	8	PR	
6	Unit 6 Concept of Somatotyping and interpretation of human physique with reference to Sheldon, Heath and Carter methods	8	PR	
7	Unit 7 Bio-cultural adaptation to environmental stresses: Concepts of Homeostasis and thermoregulation, ecological rules and their applicability among human beings	8	PR	

Semester IV (AY 2023-2024)		Period: _____ to _____		
Paper: CC9P (Human Growth and Development Lab) (Practical)		Full Marks: 20 Credit: 02		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	List of Practical 1. Evaluation of Growth status: Anthropometry (stature, body weight, mid upper arm circumference, chest circumference, head circumference), assessment of chronological age, percentile, z-score, height for age, weight for age, BMI for age	4	PR	
2	2. Obesity assessment: General obesity: BMI, Conicity index. Regional adiposity: WC, HC, WHR, WHtR)	4	JRT	
3	3. Estimation of body composition: Percent body fat skinfold thickness and bioelectric impedance analysis	4	PR	
4	4. Nutritional assessment through dietary pattern and anthropometric indices	4	JRT	

Semester IV (AY 2023-2024)		Period: _____ to _____		
Paper: CC10T (Research Methods) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Research Design Types of Researches in Anthropology – Quantitative, Qualitative, and Mixed. Review of literature, conceptual framework, formulation of research problem, formulation of hypothesis, sampling, tools and techniques of data collection, data analysis and reporting, guiding ideals and critical evaluation of major approaches in research methods, basic tenets of qualitative research and its relationship with quantitative research.	10	SD	
2	Field work tradition in Anthropology Ethnographic approach, contribution of Malinowski, Boas and other pioneers; cultural relativism, ethnocentrism, etic and emic perspectives, comparative and historical methods, techniques of rapport establishment identification of representative categories of informants, maintenance of field diary and logbook	10	SD	
3	Tools and techniques of data collection Concept of survey, relationship of survey method with ethnographic method, construction of questionnaire and interview schedule, validation and internal consistency of questionnaire Observation - Direct, Indirect, Participant, Non-participant, Controlled Interview - Structured and unstructured, Focussed Group Discussion, key informant interview, Case Study and life history, Genealogy - Technique and application	10	SD	
4	Ethics and Politics of Research 1. Identify, define, and analyze ethical issues in the context of human subject research. 2. Reasons for conducting ethical review of research, Ethical importance of consent, privacy and confidentiality in research 3. Ethical importance of consent, privacy and confidentiality in research 4. Issues of academic fraud and plagiarism, conflicts of interest, authorship and publication	10	SD	
5	Analysis and Writing Up 1. Chapterization, preparing a text for submission and publication, concepts of preface, notes (end and footnotes), glossary, prologue and epilogue, appendix, bibliography (annotated) and references cited, review and index. 2. Similarities and differences between qualitative and quantitative data analysis; introduction of software for data analysis.	10	SD	
6	Bio-Statistics 1. Types of variables, presentation and summarization of data (tabulation and illustration). 2. Descriptive statistics- Measurers of Central Tendency, Measure of Variation, Skewness and Kurtosis, Variance and standard	10	JRT	

	deviation, Normal and binomial distribution. 3. Tests of Inference- Variance ratio test, Student's 't' tests, Chi-square test and measures of association, Analysis of variance, Estimation of confidence interval, Correlation, Regression Analysis, Study design issues: Sample size and Power, 4. Pedigree Analysis- Importance and implication.			
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Semester IV (AY 2023-2024)		Period: to		
Paper: CC10P (Research Methods Lab) (Practical)		Full Marks: 20	Credit: 02	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	List of Practical 1. Construction of Genealogy. 2. Observation: Direct, Indirect, Participant, Non-participant, Controlled 3. Questionnaire and Schedule, Interview- Unstructured, Structured, Key informant interview, Focussed Group Discussion, and Free listing, pile sorting 4. Case study and life history 5. Project report writing: preparation of research problem, study design, data collection techniques, analysis and report writing based on somatometric, dermatoglyphic and serological data or any contemporary social problem.	12	SD/JRT	

Semester IV (AY 2023-2024)		Period: to		
Paper: SEC2T (Tourism Anthropology) (Theory)		Full Marks: 40	Credit: 02	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit I: Tourism- aspects and prospects, anthropological issues and theoretical concerns, tourist as ethnographer; pilgrimage and Authenticity Issues	8	AS	
2	Unit II: Interconnections between tourism history and the rise of the socio-cultural study of tourism including temporary migration, colonial exploration, pilgrimage, visiting relatives, imagined and remembered journeys, and tourism	8	AS	
3	Unit III: understand the implications of tourism as a major mechanism of cross-cultural interaction; role of symbolism, semiotics, and the imagination in tourism; tourism and the commodification of culture or cultural degradation	8	AS	
4	Unit IV: understand the global and local political economy of contemporary tourism, particularly in relation to international development; explore dynamic relationships between heritage-making enterprises, revival and preservation projects, the international flow of capital; role of museums and other branches of the cultural industries" (including music, art, and food) in tourism economies; tourism and global mobility; Ecotourism and sustainable development	8	AS	
5	Unit V: New Directions in the Anthropology of Tourism:	8	AS	

	Globalization, Tourism and Terrorism; applied aspects of anthropology in tourism development and planning.			
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**Curriculum Plan (EVEN SEMESTER)
(ANTHROPOLOGY Honours; CBCS)**

Semester VI (AY 2023-2024)		Period: _____ to _____		
Paper: CC13T (Forensic Anthropology) (Theory)		Full Marks: 40	Credit: 04	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1 Introduction to Forensic Anthropology: Definition, Brief History, Scope, Applications and Integration of Forensic Anthropology.	12	JRT/PR	
2	Unit 2 Basic Human Skeletal Biology, Identification of Human and Non-Human Skeletal Remains, Ancestry, age, sex and stature estimation from bones, Discovery and Techniques for recovering skeletonized Human Remains.	12	PR	
3	Unit 3 Personal Identification, Complete and Partial Identification, Methods of Identification in Living Persons: Anthropometry, Anthroposcopy, Occupational Marks, Scars, Bite Marks, Tattoo Marks, Fingerprints, Footprints, Lip Prints, Nails, Handwriting, Deformities and Others.	12	JRT	
4	Unit 4 Serology: Outline concept of identification and personal identification of bloodstain, urine, semen and saliva. Interpretation of patterns of bloodstains (concept only)	12	JRT	
5	Unit 5 Individualization: Forensic Odontology-Tooth Structure and Growth, Bite Marks, Facial Reconstruction, DNA Profiling.	12	PR	

Semester VI (AY 2023-2024)		Period: _____ to _____		
Paper: CC13P (Forensic Anthropology Lab) (Practical)		Full Marks: 20	Credit: 02	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of Human. Estimation of age, sex and stature from bones: Concept on Skull, long bones and pelvic girdle 2. Anthropometry and Anthroposcopy Observation on living persons.	6	PR	
2	3. Identification of bloodstain, urine, semen and saliva. 4. Examination of Fingerprints: Concept of Latent Print identification. Finger Print matching (Concept of minutiae)	6	JRT	

Semester VI (AY 2023-2024)		Period: to		
Paper: CC14T (Anthropology of India) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1 1. Origin, history and development of Anthropology in India, approaches to study Indian society and culture- traditional and contemporary 2. Racial and linguistic elements in Indian population 3. Understanding the diversity of Indian social structure - concept of Varna, Jati, Caste, Ashram or purusharatha, gender hierarchies - their economic and cultural impact, origin and evolution of social structures and their underlying philosophies.	8	SD	
2	Unit 2 1. Critical appraisal of contribution of Risley, Guha and Sarkar towards understanding ethnic distinctness in the Indian populations 2. Contribution of contemporary biological, social and archaeological anthropologists in India.	8	SD	
3	Unit 3 1. Aspects of Indian Village –social organisation, agriculture and impact of market economy on villages	8	AS	
4	Unit 3 2. Tribal situation in India- biogenetic variability, linguistic and socio-economic characteristics; Problems of tribal peoples, land-alienation, indebtedness, lack of educational facilities, shifting-cultivation, migration, forests and tribal unemployment, health and nutrition, tribal movement and quest for identity	8	AS	
5	Unit 3 3. Developmental projects- tribal displacements and rehabilitation problem	8	AS	
6	Unit 3 4. Impact of culture-contact, urbanization and industrialization on tribal and rural population	8	SD	
7	Unit 3 5. Basic concepts -Great tradition and little tradition, sacred complex, Universalization and parochialization, Sanskritization and Westernization, Dominant caste, Tribe-caste continuum, Nature-Man-Spirit complex, pseudotribalism,	8	SD	
8	Unit 4 1. Problems of exploitation and deprivation of scheduled caste/ tribe and Other Backward Classes. 2. Constitutional safeguards for the Scheduled caste and scheduled tribes.	8	AS	

Semester V (AY 2023-2024)		Period: to		
Paper: CC14P (Anthropology of India Lab) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark

1	1. Identify various traits/variables which can be used in racial classification and comment on its relevance. 2. Review a book/edited volume on Indian social structure such as caste, religion, tribe or rural population and give its salient features. 3. Explore the biological diversity of any population group considering a minimum of five genetic traits. 4. Highlight the contributions of any two contemporary Indian anthropologists	8	AS/SD	
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Semester VI (AY 2023-2024)		Period: to		
Paper: DSE3 (Tribal cultures of India) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit I: Concept of tribes and its problematic nature, General and specific characteristics of tribes, Tribes in India: Antiquity, historical, academic, administrative and anthropological importance, Denotified tribes.	6	AS	
2	Unit II: Tribe- caste continuum, Constitutional safeguard/provisions, Gender and Tribe, Distribution of tribes in India	6	AS	
3	Unit III: Tribes: Nomenclature- emic and etic differences, Classification of tribes based on their economy, occupation and religion, Racial elements among the tribes, Scheduled and non-scheduled categories of tribes	6	AS	
4	Unit IV: Tribal movements, Tribal monographs, Problems of tribal development	6	AS	
5	Unit V: Forest policies and tribes, Migration and occupational shift, Tribal arts and aesthetics Displacement, rehabilitation and social change Globalization among Indian tribes.	6	AS	

Semester VI (AY 2023-2024)		Period: to		
Paper: DSE3 (Tribal cultures of India Practical) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Distribution of Indian Tribes: PTG, ST Location of different tribes on the map of India Write an annotated bibliography on any one tribe Write the social structure of any one tribe of India	6	AS	

Semester VI (AY 2023-2024)		Period: to		
Paper: DSE4 (Project Work) (Theory and Practical)		Full Marks: 60 Credit: 06		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Project Work Student will opt either dissertation or project work or one paper from the elective discipline course. He/she will be attached with one supervisor or guide.	36	AS/SD/PR	

**Curriculum Plan (ODD SEMESTER)
(ANTHROPOLOGY Honours; CBCS)**

Semester I (AY 2023-2024)		Period: to		
Paper: CC 1T (Introduction to Biological anthropology) (Theory)		Full Marks: 40	Credit: 04	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1 Definition, Scope and sub-disciplines of Anthropology.	5	JRT	
2	Unit 1 History of Physical Anthropology and development of Modern Biological anthropology	5	JRT	
3	Unit 1 aim, scope and its relationship with allied disciplines	5	JRT	
4	Unit 1 Difference in the approaches of modern and traditional Biological Anthropology, with emphasis on human evolution and variation	5	JRT	
5	Unit 1 Application of Biological anthropology in Human welfare and development	5	JRT	
6	Unit 2 History and development of understanding human variation and evolutionary thought. Theories of evolution. Human variation and evolution:, pre-19th and post-19th Century.	5	PR	
7	Unit 2 History and development of understanding human variation and evolutionary thought. Theories of evolution. Theories of evolution. Lamarckism, Neo Lamarckism, Darwinism, Modern Synthetic theory, and Neutral theory of molecular evolution.	5	PR	
8	Unit 3 Non-human primates in relation to human evolution Classification and characteristics of living primates, with suitable examples	5	JRT	
9	Unit 3 Non-human primates in relation to human evolution Outlines of comparative anatomy and behaviour of human and non-human primates	5	JRT	
10	Unit 3 Non-human primates in relation to human evolution Significance of non-human primate study in Biological Anthropology.	5	JRT	
11	Unit 4 Great divisions of humanity UNESCO Statement on Race. Racism	5	PR	
12	Unit 4 Great divisions of humanity	5	PR	

	Outline of racial classifications: (a) World Context : Denikar, Dixon, Haddon, Hooton, Eickstedt and Coon-Garn-Birdsell (b) Indian context: Risley, Guha and Sarkar			
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Semester I (AY 2023-2024)		Period: _____ to _____		
Paper: CC 1P (Introduction to Biological Anthropology Lab) (Practical)		Full Marks: 20 Credit: 02		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Anthropometry - Maximum head length, Maximum head breadth, Minimum frontal breadth, Maximum bizygomatic breadth, Bigonial breadth, Nasal height, Nasal length, Nasal breadth, Physiognomic facial height, Morphological facial height, Physiognomic upper facial height, Morphological upper facial height, Head circumference, Stature, Sitting height, Body weight	4	PR	
2	Anthroposcopy -- Head form, Hair form, Facial form, Eye form, Nose form, Hair colour, Eye colour, Skin colour	4	JRT	
3	Evolutionary Biology: Identification of Ape Cranium (Drawing and characteristics features): Gibbon, Orang, Chimpanzee, Gorilla	4	JRT	

Semester I (AY 2023-2024)		Period: _____ to _____		
Paper: CC 2T (Introduction to Socio-cultural Anthropology) (Theory)		Full Marks: 40 Credit: 04		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1 Aim and Objectives of Social-Cultural Anthropology.	9	SD	
2	Unit 1 Scope and relevance of Social-Cultural Anthropology.	9	SD	
3	Unit 1 Relationship of Social-Cultural Anthropology with other disciplines. History of nomenclature.	9	SD	
4	Unit 2 Concepts and definitions of society and culture. Different types of Groups and Institutions. Society and community	9	AS	
5	Unit 3 A study of Social Facts; Social System and Institution; Social Action, Social Stratification and Conflict.	9	AS	
6	Unit 4 Basic units of Society: Family; Marriage; Kinship system; Economic Organization; Political Organization; Religious practices.	9	SD	

Semester I (AY 2023-2024)		Period: _____ to _____		
Paper: CC 2P (Introduction to Socio Cultural Anthropology Lab) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Methods and Techniques of Social Anthropology The practical will include the following principal methods and techniques in collection of data in Social Anthropology.	9	AS	
2	Observation, Interview, Questionnaire and Schedule, Case study , Life history	9	SD	

**Curriculum Plan (ODD SEMESTER)
(ANTHROPOLOGY Honours; CBCS)**

Semester III (AY 2023-2024)		Period: _____ to _____		
Paper: CC5T (Tribes and Peasants in India) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Anthropological Concept of Tribes - Problems of nomenclature, definition and classification.	6	AS	
2	Characteristics of Tribal Societies of the world in general. Features of tribes in India	6	AS	
3	Tribes and Wider world - The history of tribal administration; Constitutional safeguards	6	AS	
4	Draft National Tribal Policy, Issues of acculturation assimilation and integration. Impact of development schemes and programme on tribal life	6	AS	
5	Anthropological Concept of Village The concept of peasantry	6	AS	
6	Approaches to the study of peasants – economic, political and cultural.	6	AS	
7	Characteristics of Indian village: social organization; economy and changes.	6	AS	
8	Caste system and changes.	6	AS	
9	Ethnicity and Identity Issues Ethnicity issues: Concepts of Ethnicity and Ethnic Identity; Tribal and peasant movements; Identity issues	6	AS	

Semester III (AY 2023-2024)		Period: _____ to _____		
Paper: CC5P (Tribes and Peasants in India Lab)		Full Marks: 20		Credit: 02

(Practical)				
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Reading of Ethnography Student is required to read and analyse any two of the ethnographies (as listed in the reference section) and prepare a report based upon it. The report should clearly link up the study with the concept of tribe and peasantry and delineate clearly the concept used in the text.	9	AS	
2	Research questions/objectives of the study and their relevance. Theoretical schema. Methods and techniques used in the study Key findings and their significance in the context of the objectives of the study. Critical analysis of the finding on the basis of contemporary available resources.	9	AS	

Semester III (AY 2023-2024)		Period: to		
Paper: CC6T (Human Ecology: Biological & Cultural Dimensions) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Biological Dimensions Concepts in Ecology: Definition, eco-sensitivity adaptation, acclimation, acclimatization, biotic and abiotic component.	6	PR	
2	Methods of studying human ecology.	6	PR	
3	Adaptation to various ecological stresses; Ecological rules and their applicability to human populations.	6	PR	
4	Impact of urbanization and industrialization on Man	6	SD	
5	Cultural Dimensions - Culture as a tool of adaptation; various modes of human adaptation in pre-state societies. a. Hunting and food gathering b. Pastoralism c. Shifting cultivation	6	SD	
6	Ecological themes of state formation: a. Post Pleistocene Cultural Adaptation (Mesolithic) b. Neolithic revolution, c. Indus Valley Civilization, Egyptian Civilization.	6	SD	
7	Agriculture and peasantry; Civilization and growth of urban and industrial societies	6	SD	

Semester III (AY 2023-2024)		Period: to		
Paper: CC6P (Human Ecology: Biological & Cultural Dimensions Lab) (Practical)		Full Marks: 20		Credit: 02

Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Biological Dimension - Size and Shape measurements – 1. Stature 2. Sitting Height 3. Body Weight 4. Total upper extremity length 5. Total lower extremity length 6. Nasal breadth 7. Nasal height 8. Bi acromian diameter 9. Bi-Illiac diameter	10	PR	
2	Biological Dimension - Size and Shape indices- 1. Body Mass Index 2. Ponderal Index 3. Relative sitting height 4. Relative upper extremity length 5. Relative total lower extremity length 6. Nasal inde	10	PR	
3	Cultural Dimensions Research Project on Biological and Culture aspects with reference to any environmental issues.	10	SD/AS	

Semester III (AY 2023-2024)		Period: _____ to _____		
Paper: CC7T (Biological Diversity in Human Populations) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1 Concept of Biological Variability: Race/Ethnic Groups Hardy-Weinberg equilibrium. Major evolutionary forces for Genetic Variation Genetic Polymorphism (Serological, Biochemical and Molecular markers – Out line); Concept of Human Adaptation and Acclimatization (Out line). Examples from High Altitude and Cold Adaption. Concept of Allen’s, Bergman’s and Glaser’s rule	6	JRT	
2	Unit 2 Contribution of Risley, Guha, and Sarkar towards understanding ethnic elements in the Indian populations and its criticism.	6	PR	
3	Unit 3 Pre and Proto historic racial / ethnic elements in India. Linguistic classification of Indian population (Out line)	6	JRT	
4	Unit 4 Role of Bio-cultural Factors Cultural Biology; Bio-cultural factors influencing the diseases and nutritional status. Evolution of Human diet, biological perspectives of ageing process among different populations.	6	PR	
5	Unit 5 Demographic Perspective Concept of Demographic Anthropology; Sources of Demographic Data, Demographic Processes, Demographic profile of Indian populations and its growth structure; Concept of Inbreeding and Consanguinity – Biological consequences of inbreeding	6	JRT	
6	Unit 6 Genetic diversity among Indian Population	6	JRT	

Semester III (AY 2023-2024)		Period: to		
Paper: CC7P (Biological Diversity in Human Population Lab) (Practical)		Full Marks: 20 Credit: 02		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Quantitative traits: Anthropometric measurements - 1. Stature 2. Sitting Height 3. Body Weight 4. Total upper extremity length 5. Total lower extremity length 6. Nasal breadth 7. Nasal height 8. Bi acromian diameter 9. Bi-Iliiac diameter	9	PR	
2	1. Body Mass Index 2. Ponderal Index 3. Relative sitting height 4. Relative upper extremity length 5. Relative total lower extremity length 6. Nasal index	9	JRT	
3	Polymorphic trait/Markers: ABO Blood Group (as natural antigens), RhD Blood groups (as immune antigens) at least ten participants (using standard techniques). Concept of ABO blood group subtypes and Rh Blood group haplotypes	9	JRT	
4	Polygenic trait Concept of Dermatoglyphics in Population Variation. Collection of Finger Prints (Five Participants) Analysis and interpretation of basic finger pattern types [Whorl, Loop (Ulnar and Radial] and Arch] Indices: Dankmeijer Index, Furuhata's Index and Pattern Intensity index (basic comparison) Collection and interpretation (Fertility Rate, Mortality Rate) of demographic data obtained from primary or secondary sources.	9	JRT	

Semester III (AY 2023-2024)		Period: to		
Paper: SEC1T (Business and Corporate Anthropology) (Theory)		Full Marks: 40 Credit: 04		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Business and corporate Anthropology: History and subject matter	8	AS	
2	Applied anthropology in industry, application of the ethnography in business management	8	AS	
3	Anthropology and consumer behaviour	8	AS	
4	Globalization, international trade and anthropology	8	AS	
5	Techniques for Conducting Fieldwork for Business Organizations	4	AS	

Semester V (AY 2023-2024)		Period: to		
Paper: CC11T (Human Population genetics) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Basic Genetics Outline of the landmarks in the history of genetics, Principles in human genetics, Mendelian Laws: Mendelian inheritance in man. Penetrance and expressivity Outline of Quantitative genetics, quantitative/complex inheritance, multifactorial and polygenic inheritance, Multiple alleles, Co-dominance. Outline of the methodology human genetics: Family method, Twin Method, Cytogenetics, Population genetics Exceptions to Mendelian Inheritance: Outline: Linkage (Sex linkage and sex influenced traits), Epistasis and genomic imprinting	10	JRT	
2	Ecological Genetics and Polymorphism Concept of Phenotype and Genotype Genetic Polymorphism: transient polymorphism and balanced polymorphisms (Sickle cell trait and Malaria) Association of Polymorphism: Relationship of Communicable disease and non communicable disease with Blood groups.	10	JRT	
3	Equilibrium of allele frequency: Hardy-Weinberg principle Genotype and allele frequencies, Concept of Hardy-Weinberg equilibrium, its applications and alternation in evolutionary perspective	10	JRT	
4	Dynamics of Allele Frequency: Evolutionary Forces Mutation, selection (pattern and mechanism), Genetic drift (bottle neck and founder effect), Gene flow/migration, inbreeding (inbreeding co-efficient and its genetic consequences)	10	JRT	
5	Population structure and admixture in human populations Concept of Random and non-random mating (positive and negative assortative mating), heritability, linkage disequilibrium, Concept of genetic markers utility: heterozygosity (Polymorphism Information Content), Forensic Anthropology, Disease association.	10	JRT	
6	Human evolutionary genetics Concept of Evolutionary Development (Evo-Devo), Outline of Evolutionary Biology. From Mendel to molecules: A brief history of evolutionary genetics. Human-Ape comparisons.	10	JRT	

Semester V (AY 2023-2024)		Period: to		
Paper: CC11P (Human Population Genetics Lab) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark

1	Blood group typing- ABO blood group (A1, A2, B, O), MN Blood Group and Rh (D) (At least 10 participants. Allele frequency estimation. Heterozygosity score. Testing of Hardy Weinberg equilibrium.	3	JRT	
2	Color Blindness: Deutan and Protan type. Estimation of carriers. Estimation of male female ratio (at least 20 participants)	3	JRT	
3	Identification of Sex Chromatin (Inactivated X Chromosomes): one male and one female, 50 cells each	3	JRT	
4	PTC taste testing ability: At least 20 participants. Allele frequency estimation.	3	JRT	

Semester V (AY 2023-2024)		Period: _____ to _____		
Paper: CC12T (Anthropology in Practice) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Academic Anthropology Academics and Practitioners: Differences, Structure, Activities, Controversies and Issues: Applied Anthropology, Action Anthropology and Development Anthropology.	12	AS	
2	Role of Anthropology in Development Anthropology and Public Policy, Need Assessment and Community Development, Anthropology of NGO's, Management Anthropology, Environment and Community Health, Social and economic sustainability, Cultural resource management	12	AS	
3	Future Dynamics in Anthropology Trends in Anthropology: Anthropology of Tourism, Anthropology In Census operation; Designing And Fashion, Visual Anthropology	12	AS	
4	Constitutional Perspective and Human Rights Constitutional Provisions, Evaluation, Planning and Development of Indian Populations; Human Rights, Interrelationships of rights and duties: Harmony and Conflict, Protection and enforcement of human rights and duties, National and State Human Rights Commission and other grievance redressal mechanism, Human rights of special category and marginal groups, Emerging trends of human rights respective to terrorism, environment and globalization	12	SD	
5	Biosocial anthropology in practice Bio-social elements of human development at national and international level, application of conceptual framework of Forensic Anthropology in judicial settings both criminal and civil, Population Dynamics and relationship between population growth and various aspects of culture such as means of subsistence, kinship, social complexity, social stratification and political organization, Bio-	12	SD	

	social counselling of an individual or population			
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Semester V (AY 2023-2024)		Period: to		
Paper: CC12P (Anthropology in Practice Lab) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Write a project on constitutional provisions or evaluation of any development project/report.	3	SD	
2	Write a project on Religious Tourism / Tribal Tourism / Health Tourism / Fashion / Human Rights / Ecotourism.	3	SD	
3	Write a project on the demographic profile from secondary data.	3	SD	
4	Collect data on bio-social problem and design counselling and give the analysis and interpretation.	3	SD	

Semester V (AY 2023-2024)		Period: to		
Paper: DSE1 (Sports and Nutritional Anthropology) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit I: Anthropology of sports- Physical fitness, component of physical fitness	9	PR	
2	Unit II: Physical conditioning, training-techniques and physiological effects, environmental effects on physical performance: effect of heat stress, cold stress and high altitude on physiological response and performance.	9	PR	
3	Unit III: Body composition and Athletes, sports selection and monitoring	9	PR	
4	Unit IV: Human biological variability, health and nutrition; doping and performance; cultural constructions and physiologic implications of food across time, space and society; an integrated bio-behavioural perspective towards food preference.	9	PR	

Semester V (AY 2023-2024)		Period: to		
Paper: DSE 1 (Sports and Nutritional Anthropology Practical) (Practical)		Full Marks: 20		Credit: 02

Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Assessment of daily nutrient intake	12	PR	
2	Evaluate association of nutritional status and physical performance	12	PR	
3	Demonstrate cultural perspective for preference of specific food of a population	12	PR	

Semester V (AY 2023-2024)		Period: _____ to _____		
Paper: DSE2 (Paleanthropology) (Theory)		Full Marks: 40	Credit: 04	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit I: Dating methods, geological time scale, taphonomy and interpretation of the paleontological and archaeological records, taxonomic and chronological problems of fossils records.	6	AS	
2	Unit II: Primate speciation and extinctions: a geological perspective, adaptive primate radiation, differential rate of somatic evolution.	6	AS	
3	Unit III: Evolutionary biology: Origins and evolution of stone age technology (Human origins: Development, distribution and fossilized evidence of Australopithecines, Paranthropus (Zinjanthropus), Homo habilis, Homo erectus, Archaic H. sapiens, prehistoric hunter-gatherers, modern pastoral communities, emergence of prehistoric people in Africa).	6	AS	
4	Unit IV: Primate and Non-Primate Models for Early Hominid Behaviour; hominization process- Evolution of hominid-human bipedalism	6	AS	
5	Unit V: Palaeodemography- reconstruction of population patterns from skeletal analysis, determination of demographic variables in prehistoric populations and post-neolithic population growth, theory and techniques in paleodemography, methodological issues for reconstructing demographic structure, demographic models of mortality and their interpretation	6	AS	
6	Unit VI. Palaeopathology- bioarchaeological approach of disease; effects of agriculture, urbanization and slavery on health and disease; colonization and disease with special emphasis on the New World; dispersion of modern humans - molecular and morphological patterns of relationship	6	AS	

Semester V (AY 2023-2024)		Period: to		
Paper: DSE 2 (Paleoanthropology (Practical)) (Practical)		Full Marks: 20	Credit: 02	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Comparative primate osteology	9	SD/AS	
2	Description and identification of the disarticulated skeleton of non-human primates	9	SD/AS	
3	Identification and description of fossil casts	9	SD/AS	
4	Excursion to a site for seven days for collection of fossil material and its report	9	SD/AS	

Curriculum Plan (ODD SEMESTER)

(Botany Honours; CBCS)

Semester I (AY 2022-2025)		Period: to		
Paper: CC 1T(Phycology and Microbiology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to microbial world : Microbial nutrition, growth and metabolism. Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics, as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).	(7 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Viruses Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV).	(7 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Bacteria Discovery, general characteristics; Types-archaebacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction).	(7 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Algae General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction; Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups) and Van – den Hoek et.al(1982); Significant contributions of important phycologists (F.E. Fritsch, G.M. Smith, R.N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P. Iyengar). Role of algae in the environment, agriculture, biotechnology and industry.	(11 lectures)	Susanta Kumar Maity	
5	Unit 5: Cyanophyta and Xanthophyta Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of Nostoc and Vaucheria.	(8 lectures)	Susanta Kumar Maity	
6	Unit 6: Chlorophyta and Charophyta General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Chlamydomonas</i> , <i>Volvox</i> , <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> . Evolutionary significance of <i>Prochloron</i> .	(8 lectures)	Susanta Kumar Maity	
7	Unit 7: Phaeophyta and Rhodophyta: Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> .	(12 lectures)	Susanta Kumar Maity	

Semester I (AY 2022-2025)		Period: to		
Paper: CC 1P (Phycology and Microbiology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark

1	Microbiology 1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle. 2. Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule. 3. Gram staining. 4. Endospore staining with malachite green using the (endospores taken from soil bacteria). 5. Study of bacteria from root nodules/Curd sample.	20	SkMd Ismail Al Amin	
2	Phycology Study of vegetative and reproductive structures of Nostoc, <i>Chlamydomonas</i> (electron micrographs), Volvox, <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> , <i>Prochloron</i> through electron micrographs, temporary preparations and permanent slides.	20	Susanta Kumar Maity	

Semester I (AY 2022-2025)		Period: to		
Paper: CC 2T (Biomolecules and Cell Biology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biomolecules: Types and significance of chemical bonds; Structure and properties of water; pH and buffers. Carbohydrates: Nomenclature and classification; Monosaccharides ; Disaccharides; Oligosaccharides and polysaccharides. Lipids: Definition and major classes of storage and structural lipids; Fatty acids structure and functions; Essential fatty acids; Triacylglycerols structure, functions and properties; Phosphoglycerides. Proteins: Structure of amino acids; Levels of protein structure-primary, secondary, tertiary and quarternary; Protein denaturation and biological roles of proteins. Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA; Structure of tRNA.	(20 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Bioenergenetics : Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP: structure, its role as a energy currency molecule.	(4 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Enzymes: Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; Classification of enzymes; Features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation, enzyme inhibition and factors affecting enzyme activity.	(6 lectures)	Dr. Nilay Kumar Maitra	
4	Unit4: The cell: Cell as a unit of structure and function;	(4	Dr. Nilay	

	Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory).	lectures)	Kumar Maitra	
5	Unit 5: Cell wall and plasma membrane: Chemistry, structure and function of Plant cell wall. Overview of membrane function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis.	(4 lectures)	Dr. Nilay Kumar Maitra	
6	Unit 6: Cell organelles: Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament. Chloroplast, mitochondria and peroxisomes: Structural organization; Function; Semiautonomous nature of mitochondria and chloroplast. Endomembrane system: Endoplasmic Reticulum – Structure, targeting and insertion of proteins in the ER, protein folding, processing; Smooth ER and lipid synthesis, export of proteins and lipids; Golgi Apparatus – organization, protein glycosylation, protein sorting and export from Golgi Apparatus; Lysosomes	(16 lectures)	Dr. Nilay Kumar Maitra	
7	Unit 7: Cell division: Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinases.	(6 lectures)	Dr. Nilay Kumar Maitra	

Semester I (AY 2022-2025)		Period: _____ to _____		
Paper: CC 2P (: Biomolecules and Cell Biology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins.	(30 lectures)	Dr. Nilay Kumar Maitra	
2	2. Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo /Crinum.		Dr. Nilay Kumar Maitra	
3	3. Demonstration of the phenomenon of protoplasmic streaming in Hydrilla leaf.		Dr. Nilay Kumar Maitra	
4	4. Measurement of cell size by the technique of micrometry.		Dr. Nilay Kumar Maitra	
5	5. Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains).		Dr. Nilay Kumar Maitra	
6	6. Study of cell and its organelles with the help of electron micrographs.		Dr. Nilay Kumar Maitra	

7	7. Cytochemical staining of : DNA- Feulgen Actocarmin and AcetoOrcrin stain and cell wall in the epidermal peel of onion using Periodic Schiff's (PAS) staining technique.		Dr. Nilay Kumar Maitra	
8	8. Study the phenomenon of plasmolysis and deplasmolysis.		Dr. NilayKumar Maitra	
9	9. Study the effect of organic solvent and temperature on membrane permeability.		Dr. Nilay Kumar Maitra	
10	10. Study different stages of mitosis and meiosis.		Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester II (AY 2022-2025)		Period: _____ to _____		
Paper: CC 3T (Mycology and Phytopathology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to true fungi: General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification.	(6 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Chytridiomycota and Zygomycota: Characteristic features; Ecology and significance; Thallus organisation; Reproduction; Life cycle with reference to Synchytrium, Rhizopus .	(5 lecture)	Dr. Nilay Kumar Maitra	
3	Unit 3: Ascomycota: General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; Life cycle and classification with reference to Saccharomyces, Aspergillus, Penicillium, Alternaria, Neurospora and Peziza.	(10 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Basidiomycota :General characteristics; Ecology; Life cycle and Classification with reference to black stem rust on wheat Puccinia (Physiological Specialization), loose and covered smut (symptoms only), Agaricus; Bioluminescence, Fairy Rings and Mushroom Cultivation with special reference to Oyster Mashroom.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Allied Fungi: General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.	(3 lectures)	Dr. Nilay Kumar Maitra	
6	Unit 6: Oomycota: General characteristics; Ecology; Life cycle and classification with reference to Phytophthora, Albugo.	(4 lectures)	Dr. Nilay Kumar Maitra	
7	Unit 7: Symbiotic associations Lichen: – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction; Mycorrhiza-Ectomycorrhiza, Endomycorrhiza	(4 lectures)	Dr. Nilay Kumar Maitra	

	and their significance.			
8	Unit 8: Applied Mycology: Role of fungi in biotechnology; Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology.	(10 Lectures)	Dr. Nilay Kumar Maitra	
9	Unit 9: Phytopathology: Terms and concepts; General symptoms; Geographical distribution of diseases; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine.	(10 lectures)	Dr. Nilay Kumar Maitra	
10	Bacterial diseases :- Citrus canker and angular leaf spot of cotton. Viral diseases – Tobacco Mosaic viruses, vein clearing. Fungal diseases – Early blight of potato, Black stem rust of wheat, White rust of crucifers.	(10 lectures)	SkMdIsmail Al Amin	

Semester II (AY 2022-2025)		Period: to		
Paper: CC 3P(Mycology and Phytopathology)(Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Introduction to the world of fungi (Unicellular, coenocytic/septate mycelium, ascocarps&basidiocarps).	(30 lectures)	Dr. Nilay Kumar Maitra	
2	2. Rhizopus: study of asexual stage from temporary mounts and sexual structures through permanent slides.		Dr. Nilay Kumar Maitra	
3	3. Aspergillus and Penicillium: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.		Dr. Nilay Kumar Maitra	
4	4. Peziza: Ascobulus sectioning through ascocarp.		Dr. Nilay Kumar Maitra	
5	5. Alternaria: Specimens/photographs and temporary mounts.		Dr. Nilay Kumar Maitra	
6	6. Puccinia: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts.		Dr. Nilay Kumar Maitra	
7	7. Agaricus: Specimens of button stage and full grown mushroom; sectioning of gills of Agaricus, fairy rings and bioluminescent mushrooms to be shown.		Dr. Nilay Kumar Maitra	
8	8. Study of phaneroplasmodium from actual specimens and /or photograph. Study of Stemonitis sporangia.		Dr. Nilay Kumar Maitra	

9	9. Albugo: Study of symptoms of plants infected with Albugo; asexual phase study through section/ temporary mounts and sexual structures through permanent slides.		Dr. Nilay Kumar Maitra	
10	10. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs)		Dr. Nilay Kumar Maitra	
11	11. Phytopathology : Herbarium specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifers.	(10 lectures)	SkMd Ismail Al Amin	

Semester II (AY 2022-2025)		Period: _____ to _____		
Paper: CC 4T (Archegoniate) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction: Unifying features of archegoniate; Transition to land habit; Alternation of generations.	(4 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Bryophytes: General characteristics; Adaptations to land habit; Classification; Range of thallus organization.	(6 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Type Studies:- Bryophytes Classification (up to family), morphology, anatomy and reproduction of Riccia, Marchantia, Pellia, Porella, Anthoceros, Sphagnum and Funaria; Pogonatum, Reproduction and evolutionary trends in Riccia, Marchantia, Plagichasma Anthoceros and Funaria (developmental stages not included). Ecological and economic importance of bryophytes with special reference to Sphagnum.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Pteridophytes: General characteristics; Classification; Early land plants (Cooksonia and Rhynia).	(6 lectures)	Susanta Kumar Maity	
5	Unit 5: Type Studies:- Pteridophytes Classification (up to family), morphology, anatomy and reproduction of Psilotum, Selaginella, Equisetum and Pteris (Developmental details not to be included). Apogamy, and apospory, heterospory and seed habit, telome theory, stelar evolution; Ecological and economic importance.	(14 lectures)	Susanta Kumar Maity	
6	Unit 6: Gymnosperms: General characteristics, classification (up to family), morphology, anatomy and reproduction of Cycas, Pinus and Gnetum (Developmental details not to be included); Ecological and economic importance.	(18 lectures)	Susanta Kumar Maity	

Semester II (AY 2022-2025)		Period: _____ to _____		
Paper: CC 4P (Archegoniate) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Riccia – Morphology of thallus.	(15 lectures)		
2	2. Marchantia- Morphology of thallus, whole mount of rhizoids & Scales, vertical section of thallus through Gemma cup, whole mount of Gemmae (all temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte (all permanent slides).		SkMd Ismail Al Amin	
3	3. Anthoceros- Morphology of thallus, dissection of sporophyte (to show stomata, spores, pseudoelaters, columella) (temporary slide), vertical section of thallus (permanent slide).		SkMd Ismail Al Amin	
4	4. Pellia, Porella- Permanent slides.		SkMd Ismail Al Amin	
5	5. Sphagnum- Morphology of plant, whole mounts of leaf (permanent slide only).		SkMd Ismail Al Amin	
6	6. Funaria- Pogonatum/ Polytrichum Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, longitudinal section of capsule and protonema.		SkMd Ismail Al Amin	
7	7. Psilotum- Study of specimen, transverse section of synangium (permanent slide).	(15 lectures)	Susanta Kumar Maity	
8	8. Selaginella- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide).		Susanta Kumar Maity	
9	9. Equisetum- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (wet and dry) (temporary slide), transverse section of rhizome (permanent slide).		Susanta Kumar Maity	
10	10. Pteris- Morphology, transverse section of rachis, vertical section of sporophyll, whole mount of sporangium, whole mount of spores (temporary slides), transverse section of rhizome, whole mount of prothallus with sex organs and young sporophyte (permanent slide).		Susanta Kumar Maity	
11	11. Cycas- Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide).		Susanta Kumar Maity	
12	12. Pinus- Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), transverse section of Needle, transverse section of stem, longitudinal section of / transverse section of male cone, whole mount of microsporophyll, whole mount of Microspores (temporary slides), longitudinal section of female cone, tangential longitudinal section & radial longitudinal sections stem (permanent slide).		Susanta Kumar Maity	
13	13. Gnetum- Morphology (stem, male & female cones), transverse section of stem, vertical section of ovule (permanent slide)		Susanta Kumar Maity	

14	14. Botanical excursion		Susanta Kumar Maity	
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**Curriculum Plan (ODD SEMESTER)
(Botany Honours; CBCS)**

Semester III (AY 2022-2025)		Period: _____ to _____		
Paper: CC5T (Anatomy of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction and scope of Plant Anatomy: Applications in systematics, forensics and pharmacognosy.	(4 Lectures)	Susanta Kumar Maity	
2	Unit 2: Structure and Development of Plant Body Internal organization of plant body: The three tissue systems, types of cells and tissues. Development of plant body: polarity, cytodifferentiation and organogenesis during embryogenic development, Root-stem transition, Nodal anatomy – Basic concept.	(6 Lectures)	Susanta Kumar Maity	
3	Unit 3: Tissues Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation of tracheary elements and sieve elements; Pits and plasmodesmata; Wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts and laticifers.	(12 Lectures)	Susanta Kumar Maity	
4	Unit 4: Apical meristems: Evolution of concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory, continuing meristematic residue, cytohistological zonation); Types of vascular bundles; Structure of dicot and monocot stem. Origin, development, arrangement and diversity in size and shape of leaves; Structure of dicot and monocot leaf, Kranz anatomy. Organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe theory); Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin of lateral root.	(15 Lectures)	Susanta Kumar Maity	
5	Unit 5: Vascular Cambium and Wood Structure, function and seasonal activity of cambium; Secondary growth in root and stem. Anomalous secondary growth in Bignonia, Boerhaavia, Aristolochia and Dracaena. Axially and radially oriented elements; Types of rays and axial parenchyma; Cyclic aspects and reaction wood; Sapwood and heartwood; Ring and diffuse porous wood; Early and late wood, tyloses; Dendrochronology. Development and composition of periderm, rhytidome and lenticels.	(15 Lectures)	Susanta Kumar Maity	
6	Unit 6: Adaptive and Protective Systems Epidermal tissue system, cuticle, epicuticular waxes, trichomes(uni-and multicellular, glandular and nonglandular, two examples of each), stomata (classification); Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes. Mechanical tissue – distribution and significance.	(8 Lectures)	Susanta Kumar Maity	

Semester III (AY 2022-2025)		Period: to		
Paper: CC5P (Anatomy of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSE S ALLOTE D	Class taken by	Remark
1	<p>1. Study of anatomical details through permanent slides/temporary stain mounts/ macerations/museum specimens with the help of suitable examples.</p> <p>2. Apical meristem of root, shoot and vascular cambium</p> <p>3. Distribution and types of parenchyma, collenchyma and sclerenchyma.</p> <p>4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates; xylem fibres.</p> <p>5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood.</p> <p>6. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres.</p> <p>7. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular</p> <p>8. Root: monocot, dicot, secondary growth.</p> <p>9. Stem: monocot, dicot - primary and secondary growth; periderm; lenticels.</p> <p>10. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy).</p> <p>11. Adaptive Anatomy: xerophytes, hydrophytes.</p> <p>12. Secretory tissues: cavities, lithocysts and laticifers.</p>	(20 Lectur es)	Susanta Kumar Maity	

Semester III (AY 2022-2025)		Period: _____ to _____		
Paper: CC6T (Economic Botany) (Theory)		Full Marks: 40		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Origin of Cultivated Plants: Concept of Centres of Origin, their importance with reference to Vavilov’s work. Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity.</p> <p>Unit 2: Cereals: Wheat and Rice (origin, morphology, cultivation, management processing & uses); Brief account of millets.</p> <p>Unit 3: Legumes: Origin, morphology cultivation, management and uses of Chick pea, Pigeon pea and fodder legumes. Importance to man and ecosystem.</p> <p>Unit 4: Sources of sugars and starches: (Morphology cultivation, management and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, propagation & uses.</p> <p>Unit 5: Spices: Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper</p> <p>Unit 6: Beverages: Tea, Coffee (morphology, processing & uses)</p> <p>Unit 7: Sources of oils and fats :General description, classification, extraction, their uses and health implications groundnut, coconut, linseed, soybean, mustard and coconut (Botanical name, family & uses). Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.</p> <p>Unit 8: Natural Rubber: Para-rubber: tapping, processing and uses.</p> <p>Unit 9: Drug-yielding plants :Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Tobacco (Morphology, processing, uses and health hazards).</p> <p>Unit 10: Timber plants: General account with special reference to teak and pine.</p> <p>Unit 11: Fibers: Classification based on the origin of fibers; Cotton, Coir and Jute (morphology, extraction and uses).</p>	(60 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2022-2025)		Period: _____ to _____		
Paper: CC6P (Economic Botany) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Cereals: Wheat (habit sketch, L. S/T.S. grain, starch grains, micro-chemical tests) Rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests).</p> <p>2. Legumes: Soybean, Groundnut, (habit, fruit, seed structure, micro-chemical tests).</p> <p>3. Sources of sugars and starches: Sugarcane (habit sketch; cane juice-micro-chemical tests), Potato (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests).</p> <p>4. Spices: Black pepper, Fennel and Clove (habit and sections).</p> <p>5. Beverages: Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).</p> <p>6. Sources of oils and fats: Coconut- T.S. nut, Mustard-plant specimen, seeds; tests for fats in crushed seeds.</p> <p>7. Essential oil-yielding plants: Habit sketch of Rosa, Vetiveria, Santalum and Eucalyptus (specimens/photographs).</p> <p>8. Rubber: specimen, photograph/model of tapping, samples of rubber products.</p> <p>9. Drug-yielding plants: Specimens of Digitalis, Papaver and Cannabis.</p> <p>10. Tobacco: specimen and products of Tobacco.</p> <p>11. Woods: Tectona, Pinus: Specimen, Section of young stem.</p> <p>12. Fiber-yielding plants: Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).</p>	(24 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2022-2025)		Period: _____ to _____		
Paper: CC7T (Genetics) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Mendelian genetics and its extension Mendelism: History; Principles of inheritance; Chromosome theory of inheritance; Autosomes and sex chromosomes; Probability and pedigree analysis; Incomplete dominance and codominance; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Recessive and Dominant traits, Penetrance and Expressivity, Numericals; Polygenic inheritance.	(16 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Extrachromosomal Inheritance Chloroplast mutation: Variegation in Four o'clock plant; Mitochondrial mutations in yeast; Maternal effects-shell coiling in snail; Infective heredity- Kappa particles in Paramecium.	(6 lectures)	SkMd Ismail Al Amin	

3	Unit 3: Linkage, crossing over and chromosome mapping Linkage and crossing over-Cytological and molecular basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence; Numericals based on gene mapping; Sex Linkage.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Variation in chromosome number and structure Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy	(8 lectures)	SkMd Ismail Al Amin	
5	Unit 5: Gene mutations Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method. Role of Transposons in mutation.DNA repair mechanisms.	(6 lectures)	SkMd Ismail Al Amin	
6	Unit 6: Fine structure of gene Classical vs molecular concepts of gene; Cis-Trans complementation test for functional allelism; Structure of Phage T4, rII Locus.	(6 lectures)	SkMd Ismail Al Amin	
7	Unit 6. Population and Evolutionary Genetics Allele frequencies, Genotype frequencies, Hardy-Weinberg Law, role of natural selection, mutation, genetic drift. Genetic variation and Speciation.	(6 lectures)	SkMd Ismail Al Amin	

Semester III (AY 2022-2025)		Period: _____ to _____		
Paper: CC7P (Genetics) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Demonstration on pretreatment, fixation, staining and squash and smear preparation.	(40 lectures)	SkMd Ismail Al Amin	
2	2. Study of Mitosis from Onion / Garlic / Lentil root.		SkMd Ismail Al Amin	
3	3. Study of Meiosis with pollen mother cell (PMC) of Onion / Solanum / Datura by smear preparation.		SkMd Ismail Al Amin	
4	4. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.		SkMd Ismail Al Amin	
5	5. Chromosome mapping using point test cross data.		SkMd Ismail Al Amin	
6	6. Pedigree analysis for dominant and recessive autosomal and sex linked traits		SkMd Ismail Al Amin	
7	7. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).		SkMd Ismail Al Amin	
8	8. Blood Typing: groups & Rh factor.		SkMd Ismail Al Amin	

9	9. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.		SkMd Ismail Al Amin	
10	10. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.		SkMd Ismail Al Amin	
11	11. Study of human genetic traits: Sickle cell anemia, Xeroderma Pigmentosum, Albinism, red-green Colour blindness, Widow's peak, Rolling of tongue, Hitchhiker's thumb and Attached ear lobe		SkMd Ismail Al Amin	

Semester III (AY 2022-2025)		Period: to		
Paper: SEC1T (Biofertilizers) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.	(4 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.	(8 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.	(4 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.	(6 lectures)	Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester IV (AY 2022-2025)		Period: to		
Paper: CC8T (Molecular Biology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit- 1: Nucleic acids: Carriers of genetic information Historical perspective; DNA as the carrier of genetic information (Griffith's, Hershey	(60	SkMd Ismail	

	& Chase, Avery, McLeod & McCarty, Fraenkel-Conrat's experiment.	lectures)	Al Amin	
2	Unit -2. The Structures of DNA and RNA / Genetic Material DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves; Organization of DNA-Prokaryotes, Viruses, Eukaryotes. RNA Structure- Organelle DNA -- mitochondria and chloroplast DNA. The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin.			
3	Unit- 2: The replication of DNA Chemistry of DNA synthesis (Kornberg's discovery); General principles – bidirectional, semiconservative and semi discontinuous replication, RNA priming; Various models of DNA replication, including rolling circle, θ (theta) mode of replication, replication of linear ds-DNA, replication of the 5' end of linear chromosome; Enzymes involved in DNA replication.			
4	Unit- 3: Central dogma and genetic code Key experiments establishing- The Central Dogma (Adaptor hypothesis and discovery of mRNA template), Genetic code (deciphering & salient features)			
5	Unit 4: Transcription Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation; Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in E.coli. Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormones; Gene silencing.	(60 lectures)	Susanta Kumar Maity	
6	Unit 5: Processing and modification of RNA Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing (5' cap, 3' polyA tail); Ribozymes; RNA editing and mRNA transport.			
7	Unit 6: Translation Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins.			

Semester IV (AY 2022-2025)		Period: _____ to _____		
Paper: CC8P (Molecular Biology) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Preparation of LB medium and raising E.Coli.	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	
	2. Isolation of genomic DNA from <i>E. Coli</i> .			
	3. DNA isolation from cauliflower head.			
	4. DNA estimation by diphenylamine reagent/UV Spectrophotometry.			
	5. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).			
	6. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs			
	7. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)			
	8. Study of the following through photographs: Assembly of Spliceosome			

	machinery; Splicing mechanism in group I & group II introns; Ribozyme and Alternative splicing.			
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Semester IV (AY 2022-2025)		Period: to		
Paper: CC9T (Plant Ecology and Phytogeography) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Basic concepts; Levels of organization. Inter-relationships between the living world and the environment, the components and dynamism, homeostasis.	(60 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Soil Importance; Origin; Formation; Composition; Physical; Chemical and Biological components; Soil profile; Role of climate in soil development.		Dr. Nilay Kumar Maitra	
3	Unit 3: Water Importance: States of water in the environment; Atmospheric moisture; Precipitation types (rain, fog, snow, hail, dew); Hydrological Cycle; Water in soil; Water table.		Dr. Nilay Kumar Maitra	
4	Unit 4: Light, temperature, wind and fire Variations; adaptations of plants to their variation.		Dr. Nilay Kumar Maitra	
5	Unit 5: Ecosystems Structure; Processes; Trophic organisation; Food chains and Food webs; Ecological pyramids.		Dr. Nilay Kumar Maitra	
6	Unit 6: Population ecology Characteristics and Dynamics .Ecological Speciation		Dr. Nilay Kumar Maitra	
7	Unit 7: Plant communities Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts.		Dr. Nilay Kumar Maitra	
8	Unit 8: Biotic interactions Trophic organization, basic source of energy, autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop.		Dr. Nilay Kumar Maitra	
9	Unit 9: Functional aspects of ecosystem Principles and models of energy flow; Production and productivity; Ecological efficiencies; Biogeochemical cycles; Cycling of Carbon,		Dr. Nilay Kumar Maitra	

	Nitrogen and Phosphorus.			
10	Unit 10: Phytogeography Principles; Continental drift; Theory of tolerance; Endemism; Brief description of major terrestrial biomes (one each from tropical, temperate & tundra); Phytogeographical division of India; Local Vegetation.		Dr. Nilay Kumar Maitra	

Semester IV (AY 2022-2025)		Period: to		
Paper: CC9P (Plant Ecology and Phytogeography) (Practical)		Full Marks: Credit:		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	(36 lectures)	Dr. Nilay Kumar Maitra	
2	2. Determination of pH of various soil and water samples (pH meter, universal indicator/Lovibond comparator and pH paper)		Dr. Nilay Kumar Maitra	
3	3. Analysis for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency from		Dr. Nilay Kumar Maitra	
4	4. two soil samples by rapid field tests.		Dr. Nilay Kumar Maitra	
5	5. Determination of organic matter of different soil samples by Walkley& Black rapid titration		Dr. Nilay Kumar Maitra	
6	6. method		Dr. Nilay Kumar Maitra	
7	7. Comparison of bulk density, porosity and rate of infiltration of water in soils of three habitats.		Dr. Nilay Kumar Maitra	
8	8. Determination of dissolved oxygen of water samples from polluted and unpolluted sources.		Dr. Nilay Kumar Maitra	
9	9. (a). Study of morphological adaptations of hydrophytes and xerophytes (four each). (b). Study of biotic interactions of the following: Stem parasite (Cuscuta), Root parasite (Orobanchae) Epiphytes, Predation (Insectivorous plants).		Dr. Nilay Kumar Maitra	
10	10. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus, by species area curve method (species to be listed).		Dr. Nilay Kumar Maitra	
11	11. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law.		Dr. Nilay Kumar Maitra	

12	12. Quantitative analysis of herbaceous vegetation for density and abundance in the college campus. 13. Field visit to familiarise students with ecology of different sites.		Dr. Nilay Kumar Maitra	
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Semester IV (AY 2022-2025)		Period: to		
Paper: CC10T (Plant Systematics) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Significance of Plant systematics Introduction to systematics; Plant identification, Classification, Nomenclature. Evidences from palynology, cytology, phytochemistry and molecular data. Field inventory; Functions of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals; Keys: Single access and Multi-access.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Taxonomic hierarchy Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary).		Susanta Kumar Maity	
3	Unit 3: Botanical nomenclature Principles and rules (ICN); Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids.		Susanta Kumar Maity	
4	Unit 4: Systems of classification Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series); Brief reference of Angiosperm Phylogeny Group (APG III) classification.		Susanta Kumar Maity	
5	Unit 5: Biometrics, numerical taxonomy and cladistics Characters; Variations; OTUs, character weighting and coding; Cluster analysis; Phenograms, cladograms (definitions and differences).		Susanta Kumar Maity	
6	Unit 6: Phylogeny of Angiosperms Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating evolutionary relationship (phylogenetic tree, cladogram).		Susanta Kumar Maity	

Semester IV (AY 2022-2025)		Period: to		
Paper: CC10P (Plant Systematics) (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of vegetative and floral characters of the following	(36)	Susanta Kumar	

	<p>families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):</p> <ol style="list-style-type: none"> 1. Ranunculaceae - Ranunculus, Delphinium. 2. Brassicaceae - Brassica, Alyssum / Iberis. 3. Malvaceae – Sida Sp. Urenalobota. 4. Myrtaceae - Eucalyptus, Callistemon 5. Umbelliferae - Coriandrum /Anethum / Foeniculum. 6. Asteraceae - Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax. 7. Solanaceae - Solanum nigrum/Withania, Nicotina, Plumbaginefolia. 8. Lamiaceae - Salvia/Ocimum. 9. Euphorbiaceae - Euphorbia hirta/E.milii, Jatropha. 10. Fasaceae – TephrosiaSp.,Crotalaria Sp., 11. Caesalpineaeceae – Cassia Sp., 12. Asclepiadaeaceae- PesgulariaGygnema, 13. Apocynaceae – Hollorhen, Catharanthus. 14. Rubiaceae – Oldenladeae, Spermoeoceae, 15. Liliaceae - Asphodelus/Lilium/Allium. 16. Poaceae - Triticum/Hordeum/Avena. 	lectures)	Maity	
2	2. Field visit (local) – Subject to grant of funds from the university.		Susanta Kumar Maity	
3	3. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).		Susanta Kumar Maity	

Semester IV (AY 2022-2025)		Period: _____ to _____		
Paper: SEC2T (Mushroom Culture Technology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms.Types of edible mushrooms available in India - <i>Volvariellavolvacea</i> , <i>Pleurotuscitrinopileatus</i> , <i>Agaricusbisporus</i> .	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove,		Dr.Nilay Kumar	

	sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.		Maitra	
3	Unit 3: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.		Dr.Nilay Kumar Maitra	
4	Unit 4: Food Preparation:Types of foods prepared from mushroom.Research Centres - National level and Regional level.Cost benefit ratio - Marketing in India and abroad, Export Value.		Dr.Nilay Kumar Maitra	

Curriculum Plan (Botany Honours; CBCS)

Semester V (AY 2022-2025)		Period: to		
Paper: CC11T (Reproductive Biology of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction :History (contributions of G.B. Amici, W. Hofmeister, E. Strasburger, S.G. Nawaschin, P. Maheshwari, B.M. Johri, W.A. Jensen, J. Heslop-Harrison) and scope.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Reproductive development :Induction of flowering; flower as a modified determinate shoot. Flower development: genetic and molecular aspects.		Susanta Kumar Maity	
3	Unit 3: Anther and pollen biology Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Microgametogenesis; Pollen wall structure, MGU (male germ unit) structure, NPC system; Palynology and scope (a brief account); Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: Pseudomonads, polyads, massulae, pollinia.		Susanta Kumar Maity	
4	Unit 4: Ovule Structure; Types; Special structures–endothelium, obturator, aril, caruncle and hypostase; Female Gametophyte – megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis (details of <i>Polygonum</i> type); Organization and ultrastructure of mature embryo sac.		Susanta Kumar Maity	
5	Unit 5: Pollination and fertilization Pollination types and significance; adaptations; structure of stigma and style; path of pollen tube in pistil; double fertilization.		Susanta Kumar Maity	
6	Unit 6: Self incompatibility Basic concepts (interspecific, intraspecific, homomorphic, heteromorphic, GSI and SSI); Methods to overcome self- incompatibility: mixed pollination, bud pollination, stub pollination; Intra-ovarian and <i>in vitro</i> pollination; Modification of stigma surface, parasexual hybridization; Cybrids, <i>in vitro</i> fertilization.		Susanta Kumar Maity	
7	Unit 7: Embryo, Endosperm and Seed Structure and types; General pattern of development of dicot and monocot embryo and endosperm; Suspensor: structure and functions; Embryo-endosperm relationship; Nutrition of embryo; Unusual features; Embryo development in <i>Paonia</i> . Seed structure, importance and dispersal mechanisms		Susanta Kumar Maity	

8	Units 7: Polyembryony and apomixis Introduction; Classification; Causes and applications.		Susanta Kumar Maity	
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Semester V (AY 2022-2025)		Period: to		
Paper: CC11P (Reproductive Biology of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Anther: Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehisced anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation.	(40 lectures)	Susanta Kumar Maity	
2	2. Pollen grains: Fresh and acetolyzed showing ornamentation and aperture, pseudomonads, polyads, pollinia (slides/photographs, fresh material), ultrastructure of pollen wall (micrograph); Pollen viability: Tetrazolium test. germination: Calculation of percentage germination in different media using hanging drop method.		Susanta Kumar Maity	
3	3. Ovule: Types-anatropous, orthotropous, amphitropous/campylotropous, circinotropous, unitegmatic, bitegmatic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/specimens/photographs).		Susanta Kumar Maity	
4	4. Female gametophyte through permanent slides/ photographs: Types, ultrastructure of mature egg apparatus.		Susanta Kumar Maity	
5	5. Intra-ovarian pollination; Test tube pollination through photographs.		Susanta Kumar Maity	
6	6. Endosperm: Dissections of developing seeds for endosperm with free-nuclear haustoria.		Susanta Kumar Maity	
7	7. Embryogenesis: Study of development of dicot embryo through permanent slides; dissection of developing seeds for embryos at various developmental stages; Study of suspensor through electron micrographs		Susanta Kumar Maity	

Semester V (AY 2022-2025)		Period: to		
Paper: CC12T (Plant Physiology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Plant-water relations Water Potential and its components, water absorption by roots,	(60	Dr.Nilay Kumar	

	aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap – cohesion-tension theory. Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement.	lectures)	Maitra	
2	Unit 2: Mineral nutrition Essential and beneficial elements, macro and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents.		Dr.Nilay Kumar Maitra	
3	Unit 3: Nutrient Uptake Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, symport, antiport.		Dr.Nilay Kumar Maitra	
4	Unit 4: Translocation in the phloem Experimental evidence in support of phloem as the site of sugar translocation. Pressure–Flow Model; Phloem loading and unloading; Source–sink relationship.		Dr.Nilay Kumar Maitra	
5	Unit 5: Plant growth regulators Discovery, chemical nature (basic structure), bioassay and physiological roles of Auxin, Gibberellins, Cytokinin, Abscisic acid, Ethylene, Brassinosteroids and Jasmonic acid.		Dr.Nilay Kumar Maitra	
6	Unit 6: Physiology of flowering Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy.		Dr.Nilay Kumar Maitra	
7	Unit 7: Phytochrome , cryptochromes and phototropins Discovery, chemical nature, role in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action.		Dr.Nilay Kumar Maitra	

Semester V (AY 2022-2025)		Period: _____ to _____		
Paper: CC12P (Plant Physiology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Determination of osmotic potential of plant cell sap by plasmolytic method.	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Determination of water potential of given tissue (potato tuber) by weight method.		Dr.Nilay Kumar Maitra	
3	Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf.		Dr.Nilay Kumar Maitra	
4	Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophyte.		Dr.Nilay Kumar Maitra	
5	To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and xerophyte (both surfaces).		Dr.Nilay Kumar Maitra	
6	To study the phenomenon of seed germination (effect of light).		Dr.Nilay Kumar Maitra	
7	To study the effect of different concentrations of IAA on <i>Avenacoleoptile</i> elongation (IAA Bioassay).		Dr.Nilay Kumar Maitra	

8	To study the induction of amylase activity in germinating barley grains.		Dr.Nilay Kumar Maitra	
	Demonstration experiments			
	1. To demonstrate suction due to transpiration.		Dr.Nilay Kumar Maitra	
	2. Fruit ripening/Rooting from cuttings (Demonstration).		Dr.Nilay Kumar Maitra	
	3. Bolting experiment/ <i>Avenacoleptile</i> bioassay (demonstration).		Dr.Nilay Kumar Maitra	

Semester V (AY 2022-2025)		Period: to		
Paper: DSE1 (Biostatistics) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biostatistics Definition - statistical methods - basic principles. Variables - measurements, functions, limitations and uses of statistics.	(60 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Collection of data primary and secondary Types and methods of data collection procedures - merits and demerits. Classification - tabulation and presentation of data - sampling methods.		Dr.Nilay Kumar Maitra	
3	Unit 3: Measures of central tendency Mean, median, mode, geometric mean - merits & demerits. Measures of dispersion - range, standard deviation, mean deviation, quartile deviation - merits and demerits; Co-efficient of variations.		Dr.Nilay Kumar Maitra	
4	Unit 4: Correlation Types and methods of correlation, regression, simple regression equation, fitting prediction, similarities and dissimilarities of correlation and regression		Dr.Nilay Kumar Maitra	
5	Unit 5: Statistical inference Hypothesis - simple hypothesis - student 't' test - chi square test.		Dr.Nilay Kumar Maitra	

Semester V (AY 2022-2025)		Period: to		
Paper: DSE 1P (Biostatistics) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Calculation of mean, standard deviation and standard error	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Calculation of correlation coefficient values and finding out the probability		Dr.Nilay Kumar	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester VI (AY 2022-2025)		Period: _____ to _____		
Paper: CC13T (Plant Metabolism) (Theory)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Concept of metabolism Introduction, anabolic and catabolic pathways, regulation of metabolism, role of regulatory enzymes (allosteric ,covalent modulation and Isozymes).</p> <p>Unit 2: Carbon assimilation Historical background, photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, CO₂ reduction, photorespiration, C₄ pathways; Crassulacean acid metabolism; Factors affecting CO₂ reduction.</p> <p>Unit 3: Carbohydrate metabolism Synthesis and catabolism of sucrose and starch.</p> <p>Unit 4: Carbon Oxidation Glycolysis, fate of pyruvate, regulation of glycolysis, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, regulation of PDH, NADH shuttle; TCA cycle,amphibolic role, anaplerotic reactions, regulation of the cycle, mitochondrial electron transport, oxidative phosphorylation, cyanide-resistant respiration, factors affecting respiration.</p> <p>Unit 5: ATP-Synthesis Mechanism of ATP synthesis, substrate level phosphorylation, chemiosmotic mechanism (oxidative and photophosphorylation), ATP synthase, Boyers conformational model, Racker's experiment, Jagendorf's experiment; role of uncouplers.</p> <p>Unit 6: Lipid metabolism Synthesis and breakdown of triglycerides, β-oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilisation of lipids during seed germination, α oxidation</p> <p>Unit 7: Nitrogen metabolism Nitrate assimilation, biological nitrogen fixation (examples of legumes and non-legumes); Physiology and biochemistry of nitrogen fixation; Ammonia assimilation and transamination.</p> <p>Unit 8: Mechanisms of signal transduction Receptor-ligand interactions; Second messenger concept, Calcium calmodulin, MAP kinase cascade</p>	(60 lectures)	Dr.Nilay Kumar Maitra	

Semester VI (AY 2022-2025)		Period: to		
Paper: CC13P Plant Metabolism (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Chemical separation of photosynthetic pigments.</p> <p>2. Experimental demonstration of Hill's reaction.</p> <p>3. To study the effect of light intensity on the rate of photosynthesis.</p> <p>4. Effect of carbon dioxide on the rate of photosynthesis.</p> <p>5. To compare the rate of respiration in different parts of a plant.</p> <p>6. To demonstrate activity of Nitrate reductase in germinating leaves of different plant sources.</p> <p>7. To study the activity of lipases in germinating oilseeds and demonstrate mobilization of lipids 1. during germination.</p> <p>8. Demonstration of fluorescence by isolated chlorophyll pigments.</p> <p>9. Demonstration of absorption spectrum of photosynthetic pigments</p>	(35 lectures)	Dr.Nilay Kumar Maitra	

Semester VI (AY 2022-2025)		Period: to		
Paper: CC14T (Plant Biotechnology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit -1: Plant Tissue Culture Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation).</p> <p>Unit- 2: Recombinant DNA technology Restriction Endonucleases (History, Types I-IV, biological role and application);</p> <p>Unit - 5: Applications of Biotechnology Pest resistant (Bt-cotton); herbicide resistant plants (RoundUp Ready soybean); Transgenic crops with improved</p>	(30 lectures)	Susanta Kumar Maity	

	quality traits (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines; Industrial enzymes (Aspergillase, Protease, Lipase); Genetically Engineered Products–Human Growth Hormone; Humulin; Biosafety concerns.			
2	<p>Unit- 2: Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC).</p> <p>Unit- 3: Gene Cloning Recombinant DNA, Bacterial Transformation and selection of recombinant clones, PCR mediated gene cloning; Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; PCR</p> <p>Unit- 4: Methods of gene transfer Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).</p>	(30 lectures)	SkMd Ismail Al Amin	

Semester V (AY 2022-2025)		Period: _____ to _____		
Paper: CC14P (_____) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. (a) Preparation of MS medium. (b) Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc.</p> <p>2. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs.</p> <p>3. Isolation of protoplasts.</p>	(16 lectures)	Susanta Kumar Maity	
2	<p>4. Construction of restriction map of circular and linear DNA from the data provided.</p> <p>5. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene</p> <p>6. transfer by electroporation, microinjection, microprojectile bombardment.</p> <p>7. Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs.</p> <p>8. Isolation of plasmid DNA.</p> <p>9. Restriction digestion and gel electrophoresis of plasmid DNA.</p>	(16 lectures)	SkMd Ismail Al Amin	

Semester VI (AY 2022-2025)		Period: _____ to _____		
Paper: DSE3 (Industrial and Environmental		Full Marks: _____		Credit: _____

Microbiology) (Theory)				
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Scope of microbes in industry and environment</p> <p>Unit 2: Bioreactors/Fermenters and fermentation processes Solid-state and liquid-state (stationary and submerged) fermentations; Batch and continuous fermentations. Components of a typical bioreactor, Types of bioreactors laboratory, pilotscale and production fermenters; Constantly stirred tank fermenter, tower fermenter, fixed bed and fluidized bed bioreactors and air-lift fermenter. A visit to any educational institute/ industry to see an industrial fermenter, and other downstream processing operations.</p> <p>Unit 3: Microbial production of industrial products Microorganisms involved, media, fermentation conditions, downstream processing and uses; Filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilization, spray drying; Hands on microbial fermentations for the production and estimation (qualitative and quantitative) of Enzyme: amylase or lipase activity, Organic acid (citric acid or glutamic acid), alcohol (Ethanol) and antibiotic (Penicillin)</p> <p>Unit 4: Microbial enzymes of industrial interest and enzyme immobilization Microorganisms for industrial applications and hands on screening microorganisms for casein hydrolysis; starch hydrolysis; cellulose hydrolysis. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase).</p> <p>Unit 5: Microbes and quality of environment. Distribution of microbes in air; Isolation of microorganisms from soil, air and water.</p> <p>Unit 6: Microbial flora of water. Water pollution, role of microbes in sewage and domestic waste water treatment systems. Determination of BOD, COD, TDS and TOC of water samples; Microorganisms as indicators of water quality, check coliform and fecal coliform in water samples.</p> <p>Unit 7: Microbes in agriculture and remediation of contaminated soils. Biological fixation; Mycorrhizae; Bioremediation of contaminated soils. Isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.</p>	(50 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2022-2025)		Period: to		
Paper: DSE3 (Industrial and Environmental Microbiology) (Practical)		Full Marks: Credit:		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Principles and functioning of instruments in microbiology laboratory</p> <p>2. Hands on sterilization techniques and preparation of culture media.</p>	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2022-2025)		Period: to		
Paper: DSE4 (Analytical Techniques in Plant Sciences) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit- 1: Imaging and related techniques Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.</p> <p>Unit- 2: Cell fractionation Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl₂ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.</p> <p>Unit- 3: Radioisotopes Use in biological research, autoradiography, pulse chase experiment.</p> <p>Unit- 4: Spectrophotometry Principle and its application in biological research.</p> <p>Unit- 5: Chromatography Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.</p> <p>Unit- 6: Characterization of proteins and nucleic acids Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE</p> <p>Unit- 7: Biostatistics Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.</p>	(50 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2022-2025)		Period: to		
Paper: DSE4 (Analytical Techniques in Plant Sciences) (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Study of Blotting techniques: Southern, Northern and Western, DNA	(30)	SkMd Ismail Al	

	<p>fingerprinting, DNA sequencing, PCR through photographs.</p> <p>2. Demonstration of ELISA.</p> <p>3. To separate nitrogenous bases by paper chromatography.</p> <p>4. To separate sugars by thin layer chromatography.</p> <p>5. Isolation of chloroplasts by differential centrifugation.</p> <p>6. To separate chloroplast pigments by column chromatography.</p> <p>7. To estimate protein concentration through Lowry's methods. 8. To separate proteins using PAGE.</p> <p>9. To separation DNA (marker) using AGE.</p> <p>10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).</p> <p>11. Preparation of permanent slides (double staining)</p>	lectures)	Amin & Susanta Kumar Maity	
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**Curriculum Plan (ODD SEMESTER)
(Botany Honours; CBCS)**

Semester I (AY 2021-2024)		Period: to		
Paper: CC 1T(Phycology and Microbiology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to microbial world : Microbial nutrition, growth and metabolism. Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics, as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).	(7 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Viruses Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV).	(7 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Bacteria Discovery, general characteristics; Types-archaebacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction).	(7 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Algae General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction; Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups) and Van – den Hoek et.al(1982); Significant contributions of important phycologists (F.E. Fritsch, G.M. Smith, R.N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P. Iyengar). Role of algae in the environment, agriculture, biotechnology and industry.	(11 lectures)	Susanta Kumar Maity	
5	Unit 5: Cyanophyta and Xanthophyta Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of Nostoc and Vaucheria.	(8 lectures)	Susanta Kumar Maity	
6	Unit 6: Chlorophyta and Charophyta General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Chlamydomonas</i> , <i>Volvox</i> , <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> . Evolutionary significance of <i>Prochloron</i> .	(8 lectures)	Susanta Kumar Maity	
7	Unit 7: Phaeophyta and Rhodophyta: Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> .	(12 lectures)	Susanta Kumar Maity	

Semester I (AY 2021-2024)		Period: to		
Paper: CC 1P (Phycology and Microbiology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark

1	Microbiology 1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle. 2. Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule. 3. Gram staining. 4. Endospore staining with malachite green using the (endospores taken from soil bacteria). 5. Study of bacteria from root nodules/Curd sample.	20	SkMd Ismail Al Amin	
2	Phycology Study of vegetative and reproductive structures of Nostoc, <i>Chlamydomonas</i> (electron micrographs), Volvox, <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> , <i>Prochloron</i> through electron micrographs, temporary preparations and permanent slides.	20	Susanta Kumar Maity	

Semester I (AY 2021-2024)		Period: to		
Paper: CC 2T (Biomolecules and Cell Biology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biomolecules: Types and significance of chemical bonds; Structure and properties of water; pH and buffers. Carbohydrates: Nomenclature and classification; Monosaccharides ; Disaccharides; Oligosaccharides and polysaccharides. Lipids: Definition and major classes of storage and structural lipids; Fatty acids structure and functions; Essential fatty acids; Triacylglycerols structure, functions and properties; Phosphoglycerides. Proteins: Structure of amino acids; Levels of protein structure-primary, secondary, tertiary and quarternary; Protein denaturation and biological roles of proteins. Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA; Structure of tRNA.	(20 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Bioenergetics : Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP: structure, its role as a energy currency molecule.	(4 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Enzymes: Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; Classification of enzymes; Features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation, enzyme inhibition and factors affecting enzyme activity.	(6 lectures)	Dr. Nilay Kumar Maitra	
4	Unit4: The cell: Cell as a unit of structure and function;	(4	Dr. Nilay	

	Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory).	lectures)	Kumar Maitra	
5	Unit 5: Cell wall and plasma membrane: Chemistry, structure and function of Plant cell wall. Overview of membrane function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis.	(4 lectures)	Dr. Nilay Kumar Maitra	
6	Unit 6: Cell organelles: Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament. Chloroplast, mitochondria and peroxisomes: Structural organization; Function; Semiautonomous nature of mitochondria and chloroplast. Endomembrane system: Endoplasmic Reticulum – Structure, targeting and insertion of proteins in the ER, protein folding, processing; Smooth ER and lipid synthesis, export of proteins and lipids; Golgi Apparatus – organization, protein glycosylation, protein sorting and export from Golgi Apparatus; Lysosomes	(16 lectures)	Dr. Nilay Kumar Maitra	
7	Unit 7: Cell division: Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinases.	(6 lectures)	Dr. Nilay Kumar Maitra	

Semester I (AY 2021-2024)		Period: to		
Paper: CC 2P (: Biomolecules and Cell Biology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins.	(30 lectures)	Dr. Nilay Kumar Maitra	
2	2. Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo /Crinum.		Dr. Nilay Kumar Maitra	
3	3. Demonstration of the phenomenon of protoplasmic streaming in Hydrilla leaf.		Dr. Nilay Kumar Maitra	
4	4. Measurement of cell size by the technique of micrometry.		Dr. Nilay Kumar Maitra	
5	5. Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains).		Dr. Nilay Kumar Maitra	
6	6. Study of cell and its organelles with the help of electron micrographs.		Dr. Nilay Kumar Maitra	

7	7. Cytochemical staining of : DNA- Feulgen Actocarmin and AcetoOrcrin stain and cell wall in the epidermal peel of onion using Periodic Schiff's (PAS) staining technique.		Dr. Nilay Kumar Maitra	
8	8. Study the phenomenon of plasmolysis and deplasmolysis.		Dr. NilayKumar Maitra	
9	9. Study the effect of organic solvent and temperature on membrane permeability.		Dr. Nilay Kumar Maitra	
10	10. Study different stages of mitosis and meiosis.		Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester II (AY 2021-2024)		Period: _____ to _____		
Paper: CC 3T (Mycology and Phytopathology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to true fungi: General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification.	(6 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Chytridiomycota and Zygomycota: Characteristic features; Ecology and significance; Thallus organisation; Reproduction; Life cycle with reference to Synchytrium, Rhizopus .	(5 lecture)	Dr. Nilay Kumar Maitra	
3	Unit 3: Ascomycota: General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; Life cycle and classification with reference to Saccharomyces, Aspergillus, Penicillium, Alternaria, Neurospora and Peziza.	(10 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Basidiomycota :General characteristics; Ecology; Life cycle and Classification with reference to black stem rust on wheat Puccinia (Physiological Specialization), loose and covered smut (symptoms only), Agaricus; Bioluminescence, Fairy Rings and Mushroom Cultivation with special reference to Oyster Mashroom.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Allied Fungi: General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.	(3 lectures)	Dr. Nilay Kumar Maitra	
6	Unit 6: Oomycota: General characteristics; Ecology; Life cycle and classification with reference to Phytophthora, Albugo.	(4 lectures)	Dr. Nilay Kumar Maitra	
7	Unit 7: Symbiotic associations Lichen: – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction; Mycorrhiza-Ectomycorrhiza, Endomycorrhiza	(4 lectures)	Dr. Nilay Kumar Maitra	

	and their significance.			
8	Unit 8: Applied Mycology: Role of fungi in biotechnology; Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology.	(10 Lectures)	Dr. Nilay Kumar Maitra	
9	Unit 9: Phytopathology: Terms and concepts; General symptoms; Geographical distribution of diseases; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine.	(10 lectures)	Dr. Nilay Kumar Maitra	
10	Bacterial diseases :- Citrus canker and angular leaf spot of cotton. Viral diseases – Tobacco Mosaic viruses, vein clearing. Fungal diseases – Early blight of potato, Black stem rust of wheat, White rust of crucifers.	(10 lectures)	SkMdIsmail Al Amin	

Semester II (AY 2021-2024)		Period: to		
Paper: CC 3P(Mycology and Phytopathology)(Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Introduction to the world of fungi (Unicellular, coenocytic/septate mycelium, ascocarps&basidiocarps).	(30 lectures)	Dr. Nilay Kumar Maitra	
2	2. Rhizopus: study of asexual stage from temporary mounts and sexual structures through permanent slides.		Dr. Nilay Kumar Maitra	
3	3. Aspergillus and Penicillium: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.		Dr. Nilay Kumar Maitra	
4	4. Peziza: Ascobulus sectioning through ascocarp.		Dr. Nilay Kumar Maitra	
5	5. Alternaria: Specimens/photographs and temporary mounts.		Dr. Nilay Kumar Maitra	
6	6. Puccinia: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts.		Dr. Nilay Kumar Maitra	
7	7. Agaricus: Specimens of button stage and full grown mushroom; sectioning of gills of Agaricus, fairy rings and bioluminescent mushrooms to be shown.		Dr. Nilay Kumar Maitra	
8	8. Study of phaneroplasmodium from actual specimens and /or photograph. Study of Stemonitis sporangia.		Dr. Nilay Kumar Maitra	

9	9. Albugo: Study of symptoms of plants infected with Albugo; asexual phase study through section/ temporary mounts and sexual structures through permanent slides.		Dr. Nilay Kumar Maitra	
10	10. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs)		Dr. Nilay Kumar Maitra	
11	11. Phytopathology : Herbarium specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifers.	(10 lectures)	SkMd Ismail Al Amin	

Semester II (AY 2021-2024)		Period: _____ to _____		
Paper: CC 4T (Archegoniate) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction: Unifying features of archegoniate; Transition to land habit; Alternation of generations.	(4 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Bryophytes: General characteristics; Adaptations to land habit; Classification; Range of thallus organization.	(6 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Type Studies:- Bryophytes Classification (up to family), morphology, anatomy and reproduction of Riccia, Marchantia, Pellia, Porella, Anthoceros, Sphagnum and Funaria; Pogonatum, Reproduction and evolutionary trends in Riccia, Marchantia, Plagichasma Anthoceros and Funaria (developmental stages not included). Ecological and economic importance of bryophytes with special reference to Sphagnum.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Pteridophytes: General characteristics; Classification; Early land plants (Cooksonia and Rhynia).	(6 lectures)	Susanta Kumar Maity	
5	Unit 5: Type Studies:- Pteridophytes Classification (up to family), morphology, anatomy and reproduction of Psilotum, Selaginella, Equisetum and Pteris (Developmental details not to be included). Apogamy, and apospory, heterospory and seed habit, telome theory, stelar evolution; Ecological and economic importance.	(14 lectures)	Susanta Kumar Maity	
6	Unit 6: Gymnosperms: General characteristics, classification (up to family), morphology, anatomy and reproduction of Cycas, Pinus and Gnetum (Developmental details not to be included); Ecological and economic importance.	(18 lectures)	Susanta Kumar Maity	

Semester II (AY 2021-2024)		Period: _____ to _____		
Paper: CC 4P (Archegoniate) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Riccia – Morphology of thallus.	(15 lectures)		
2	2. Marchantia- Morphology of thallus, whole mount of rhizoids & Scales, vertical section of thallus through Gemma cup, whole mount of Gemmae (all temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte (all permanent slides).		SkMd Ismail Al Amin	
3	3. Anthoceros- Morphology of thallus, dissection of sporophyte (to show stomata, spores, pseudoelaters, columella) (temporary slide), vertical section of thallus (permanent slide).		SkMd Ismail Al Amin	
4	4. Pellia, Porella- Permanent slides.		SkMd Ismail Al Amin	
5	5. Sphagnum- Morphology of plant, whole mounts of leaf (permanent slide only).		SkMd Ismail Al Amin	
6	6. Funaria- Pogonatum/ Polytrichum Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, longitudinal section of capsule and protonema.		SkMd Ismail Al Amin	
7	7. Psilotum- Study of specimen, transverse section of synangium (permanent slide).	(15 lectures)	Susanta Kumar Maity	
8	8. Selaginella- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide).		Susanta Kumar Maity	
9	9. Equisetum- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (wet and dry) (temporary slide), transverse section of rhizome (permanent slide).		Susanta Kumar Maity	
10	10. Pteris- Morphology, transverse section of rachis, vertical section of sporophyll, whole mount of sporangium, whole mount of spores (temporary slides), transverse section of rhizome, whole mount of prothallus with sex organs and young sporophyte (permanent slide).		Susanta Kumar Maity	
11	11. Cycas- Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide).		Susanta Kumar Maity	
12	12. Pinus- Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), transverse section of Needle, transverse section of stem, longitudinal section of / transverse section of male cone, whole mount of microsporophyll, whole mount of Microspores (temporary slides), longitudinal section of female cone, tangential longitudinal section & radial longitudinal sections stem (permanent slide).		Susanta Kumar Maity	
13	13. Gnetum- Morphology (stem, male & female cones), transverse section of stem, vertical section of ovule (permanent slide)		Susanta Kumar Maity	

14	14. Botanical excursion		Susanta Kumar Maity	
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**Curriculum Plan (ODD SEMESTER)
(Botany Honours; CBCS)**

Semester III (AY 2021-2024)		Period: _____ to _____		
Paper: CC5T (Anatomy of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction and scope of Plant Anatomy: Applications in systematics, forensics and pharmacognosy.	(4 Lectures)	Susanta Kumar Maity	
2	Unit 2: Structure and Development of Plant Body Internal organization of plant body: The three tissue systems, types of cells and tissues. Development of plant body: polarity, cytodifferentiation and organogenesis during embryogenic development, Root-stem transition, Nodal anatomy – Basic concept.	(6 Lectures)	Susanta Kumar Maity	
3	Unit 3: Tissues Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation of tracheary elements and sieve elements; Pits and plasmodesmata; Wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts and laticifers.	(12 Lectures)	Susanta Kumar Maity	
4	Unit 4: Apical meristems: Evolution of concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory, continuing meristematic residue, cytohistological zonation); Types of vascular bundles; Structure of dicot and monocot stem. Origin, development, arrangement and diversity in size and shape of leaves; Structure of dicot and monocot leaf, Kranz anatomy. Organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe theory); Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin of lateral root.	(15 Lectures)	Susanta Kumar Maity	
5	Unit 5: Vascular Cambium and Wood Structure, function and seasonal activity of cambium; Secondary growth in root and stem. Anomalous secondary growth in Bignonia, Boerhaavia, Aristolochia and Dracaena. Axially and radially oriented elements; Types of rays and axial parenchyma; Cyclic aspects and reaction wood; Sapwood and heartwood; Ring and diffuse porous wood; Early and late wood, tyloses; Dendrochronology. Development and composition of periderm, rhytidome and lenticels.	(15 Lectures)	Susanta Kumar Maity	
6	Unit 6: Adaptive and Protective Systems Epidermal tissue system, cuticle, epicuticular waxes, trichomes(uni-and multicellular, glandular and nonglandular, two examples of each), stomata (classification); Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes. Mechanical tissue – distribution and significance.	(8 Lectures)	Susanta Kumar Maity	

Semester III (AY 2021-2024)		Period: to		
Paper: CC5P (Anatomy of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSE S ALLOTE D	Class taken by	Remark
1	<p>1. Study of anatomical details through permanent slides/temporary stain mounts/ macerations/museum specimens with the help of suitable examples.</p> <p>2. Apical meristem of root, shoot and vascular cambium</p> <p>3. Distribution and types of parenchyma, collenchyma and sclerenchyma.</p> <p>4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates; xylem fibres.</p> <p>5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood.</p> <p>6. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres.</p> <p>7. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular</p> <p>8. Root: monocot, dicot, secondary growth.</p> <p>9. Stem: monocot, dicot - primary and secondary growth; periderm; lenticels.</p> <p>10. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy).</p> <p>11. Adaptive Anatomy: xerophytes, hydrophytes.</p> <p>12. Secretory tissues: cavities, lithocysts and laticifers.</p>	(20 Lectur es)	Susanta Kumar Maity	

Semester III (AY 2021-2024)		Period: _____ to _____		
Paper: CC6T (Economic Botany) (Theory)		Full Marks: 40		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Origin of Cultivated Plants: Concept of Centres of Origin, their importance with reference to Vavilov’s work. Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity.</p> <p>Unit 2: Cereals: Wheat and Rice (origin, morphology, cultivation, management processing & uses); Brief account of millets.</p> <p>Unit 3: Legumes: Origin, morphology cultivation, management and uses of Chick pea, Pigeon pea and fodder legumes. Importance to man and ecosystem.</p> <p>Unit 4: Sources of sugars and starches: (Morphology cultivation, management and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, propagation & uses.</p> <p>Unit 5: Spices: Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper</p> <p>Unit 6: Beverages: Tea, Coffee (morphology, processing & uses)</p> <p>Unit 7: Sources of oils and fats :General description, classification, extraction, their uses and health implications groundnut, coconut, linseed, soybean, mustard and coconut (Botanical name, family & uses). Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.</p> <p>Unit 8: Natural Rubber: Para-rubber: tapping, processing and uses.</p> <p>Unit 9: Drug-yielding plants :Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Tobacco (Morphology, processing, uses and health hazards).</p> <p>Unit 10: Timber plants: General account with special reference to teak and pine.</p> <p>Unit 11: Fibers: Classification based on the origin of fibers; Cotton, Coir and Jute (morphology, extraction and uses).</p>	(60 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2021-2024)		Period: _____ to _____		
Paper: CC6P (Economic Botany) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Cereals: Wheat (habit sketch, L. S/T.S. grain, starch grains, micro-chemical tests) Rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests).</p> <p>2. Legumes: Soybean, Groundnut, (habit, fruit, seed structure, micro-chemical tests).</p> <p>3. Sources of sugars and starches: Sugarcane (habit sketch; cane juice-micro-chemical tests), Potato (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests).</p> <p>4. Spices: Black pepper, Fennel and Clove (habit and sections).</p> <p>5. Beverages: Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).</p> <p>6. Sources of oils and fats: Coconut- T.S. nut, Mustard-plant specimen, seeds; tests for fats in crushed seeds.</p> <p>7. Essential oil-yielding plants: Habit sketch of Rosa, Vetiveria, Santalum and Eucalyptus (specimens/photographs).</p> <p>8. Rubber: specimen, photograph/model of tapping, samples of rubber products.</p> <p>9. Drug-yielding plants: Specimens of Digitalis, Papaver and Cannabis.</p> <p>10. Tobacco: specimen and products of Tobacco.</p> <p>11. Woods: Tectona, Pinus: Specimen, Section of young stem.</p> <p>12. Fiber-yielding plants: Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).</p>	(24 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2021-2024)		Period: _____ to _____		
Paper: CC7T (Genetics) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Mendelian genetics and its extension Mendelism: History; Principles of inheritance; Chromosome theory of inheritance; Autosomes and sex chromosomes; Probability and pedigree analysis; Incomplete dominance and codominance; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Recessive and Dominant traits, Penetrance and Expressivity, Numericals; Polygenic inheritance.	(16 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Extrachromosomal Inheritance Chloroplast mutation: Variegation in Four o'clock plant; Mitochondrial mutations in yeast; Maternal effects-shell coiling in snail; Infective heredity- Kappa particles in Paramecium.	(6 lectures)	SkMd Ismail Al Amin	

3	Unit 3: Linkage, crossing over and chromosome mapping Linkage and crossing over-Cytological and molecular basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence; Numericals based on gene mapping; Sex Linkage.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Variation in chromosome number and structure Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy	(8 lectures)	SkMd Ismail Al Amin	
5	Unit 5: Gene mutations Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method. Role of Transposons in mutation.DNA repair mechanisms.	(6 lectures)	SkMd Ismail Al Amin	
6	Unit 6: Fine structure of gene Classical vs molecular concepts of gene; Cis-Trans complementation test for functional allelism; Structure of Phage T4, rII Locus.	(6 lectures)	SkMd Ismail Al Amin	
7	Unit 6. Population and Evolutionary Genetics Allele frequencies, Genotype frequencies, Hardy-Weinberg Law, role of natural selection, mutation, genetic drift. Genetic variation and Speciation.	(6 lectures)	SkMd Ismail Al Amin	

Semester III (AY 2021-2024)		Period: _____ to _____		
Paper: CC7P (Genetics) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Demonstration on pretreatment, fixation, staining and squash and smear preparation.	(40 lectures)	SkMd Ismail Al Amin	
2	2. Study of Mitosis from Onion / Garlic / Lentil root.		SkMd Ismail Al Amin	
3	3. Study of Meiosis with pollen mother cell (PMC) of Onion / Solanum / Datura by smear preparation.		SkMd Ismail Al Amin	
4	4. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.		SkMd Ismail Al Amin	
5	5. Chromosome mapping using point test cross data.		SkMd Ismail Al Amin	
6	6. Pedigree analysis for dominant and recessive autosomal and sex linked traits		SkMd Ismail Al Amin	
7	7. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).		SkMd Ismail Al Amin	
8	8. Blood Typing: groups & Rh factor.		SkMd Ismail Al Amin	

9	9. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.		SkMd Ismail Al Amin	
10	10. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.		SkMd Ismail Al Amin	
11	11. Study of human genetic traits: Sickle cell anemia, Xeroderma Pigmentosum, Albinism, red-green Colour blindness, Widow's peak, Rolling of tongue, Hitchhiker's thumb and Attached ear lobe		SkMd Ismail Al Amin	

Semester III (AY 2021-2024)		Period: to		
Paper: SEC1T (Biofertilizers) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.	(4 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.	(8 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.	(4 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.	(6 lectures)	Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester IV (AY 2021-2024)		Period: to		
Paper: CC8T (Molecular Biology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit- 1: Nucleic acids: Carriers of genetic information Historical perspective; DNA as the carrier of genetic information (Griffith's, Hershey	(60	SkMd Ismail	

	& Chase, Avery, McLeod & McCarty, Fraenkel-Conrat's experiment.	lectures)	Al Amin	
2	Unit -2. The Structures of DNA and RNA / Genetic Material DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves; Organization of DNA-Prokaryotes, Viruses, Eukaryotes. RNA Structure- Organelle DNA -- mitochondria and chloroplast DNA. The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin.			
3	Unit- 2: The replication of DNA Chemistry of DNA synthesis (Kornberg's discovery); General principles – bidirectional, semiconservative and semi discontinuous replication, RNA priming; Various models of DNA replication, including rolling circle, θ (theta) mode of replication, replication of linear ds-DNA, replication of the 5' end of linear chromosome; Enzymes involved in DNA replication.			
4	Unit- 3: Central dogma and genetic code Key experiments establishing- The Central Dogma (Adaptor hypothesis and discovery of mRNA template), Genetic code (deciphering & salient features)			
5	Unit 4: Transcription Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation; Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in E.coli. Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormones; Gene silencing.	(60 lectures)	Susanta Kumar Maity	
6	Unit 5: Processing and modification of RNA Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing (5' cap, 3' polyA tail); Ribozymes; RNA editing and mRNA transport.			
7	Unit 6: Translation Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins.			

Semester IV (AY 2021-2024)		Period: _____ to _____		
Paper: CC8P (Molecular Biology) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Preparation of LB medium and raising E.Coli.	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	
	2. Isolation of genomic DNA from <i>E. Coli</i> .			
	3. DNA isolation from cauliflower head.			
	4. DNA estimation by diphenylamine reagent/UV Spectrophotometry.			
	5. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).			
	6. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs			
	7. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)			
	8. Study of the following through photographs: Assembly of Spliceosome			

	machinery; Splicing mechanism in group I & group II introns; Ribozyme and Alternative splicing.			
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Semester IV (AY 2021-2024)		Period: to		
Paper: CC9T (Plant Ecology and Phytogeography) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Basic concepts; Levels of organization. Inter-relationships between the living world and the environment, the components and dynamism, homeostasis.	(60 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Soil Importance; Origin; Formation; Composition; Physical; Chemical and Biological components; Soil profile; Role of climate in soil development.		Dr. Nilay Kumar Maitra	
3	Unit 3: Water Importance: States of water in the environment; Atmospheric moisture; Precipitation types (rain, fog, snow, hail, dew); Hydrological Cycle; Water in soil; Water table.		Dr. Nilay Kumar Maitra	
4	Unit 4: Light, temperature, wind and fire Variations; adaptations of plants to their variation.		Dr. Nilay Kumar Maitra	
5	Unit 5: Ecosystems Structure; Processes; Trophic organisation; Food chains and Food webs; Ecological pyramids.		Dr. Nilay Kumar Maitra	
6	Unit 6: Population ecology Characteristics and Dynamics .Ecological Speciation		Dr. Nilay Kumar Maitra	
7	Unit 7: Plant communities Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts.		Dr. Nilay Kumar Maitra	
8	Unit 8: Biotic interactions Trophic organization, basic source of energy, autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop.		Dr. Nilay Kumar Maitra	
9	Unit 9: Functional aspects of ecosystem Principles and models of energy flow; Production and productivity; Ecological efficiencies; Biogeochemical cycles; Cycling of Carbon,		Dr. Nilay Kumar Maitra	

	Nitrogen and Phosphorus.			
10	Unit 10: Phytogeography Principles; Continental drift; Theory of tolerance; Endemism; Brief description of major terrestrial biomes (one each from tropical, temperate & tundra); Phytogeographical division of India; Local Vegetation.		Dr. Nilay Kumar Maitra	

Semester IV (AY 2021-2024)		Period: to		
Paper: CC9P (Plant Ecology and Phytogeography) (Practical)		Full Marks: Credit:		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	(36 lectures)	Dr. Nilay Kumar Maitra	
2	2. Determination of pH of various soil and water samples (pH meter, universal indicator/Lovibond comparator and pH paper)		Dr. Nilay Kumar Maitra	
3	3. Analysis for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency from		Dr. Nilay Kumar Maitra	
4	4. two soil samples by rapid field tests.		Dr. Nilay Kumar Maitra	
5	5. Determination of organic matter of different soil samples by Walkley& Black rapid titration		Dr. Nilay Kumar Maitra	
6	6. method		Dr. Nilay Kumar Maitra	
7	7. Comparison of bulk density, porosity and rate of infiltration of water in soils of three habitats.		Dr. Nilay Kumar Maitra	
8	8. Determination of dissolved oxygen of water samples from polluted and unpolluted sources.		Dr. Nilay Kumar Maitra	
9	9. (a). Study of morphological adaptations of hydrophytes and xerophytes (four each). (b). Study of biotic interactions of the following: Stem parasite (Cuscuta), Root parasite (Orobanchae) Epiphytes, Predation (Insectivorous plants).		Dr. Nilay Kumar Maitra	
10	10. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus, by species area curve method (species to be listed).		Dr. Nilay Kumar Maitra	
11	11. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law.		Dr. Nilay Kumar Maitra	

12	12. Quantitative analysis of herbaceous vegetation for density and abundance in the college campus. 13. Field visit to familiarise students with ecology of different sites.		Dr. Nilay Kumar Maitra	
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Semester IV (AY 2021-2024)		Period: to		
Paper: CC10T (Plant Systematics) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Significance of Plant systematics Introduction to systematics; Plant identification, Classification, Nomenclature. Evidences from palynology, cytology, phytochemistry and molecular data. Field inventory; Functions of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals; Keys: Single access and Multi-access.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Taxonomic hierarchy Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary).		Susanta Kumar Maity	
3	Unit 3: Botanical nomenclature Principles and rules (ICN); Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids.		Susanta Kumar Maity	
4	Unit 4: Systems of classification Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series); Brief reference of Angiosperm Phylogeny Group (APG III) classification.		Susanta Kumar Maity	
5	Unit 5: Biometrics, numerical taxonomy and cladistics Characters; Variations; OTUs, character weighting and coding; Cluster analysis; Phenograms, cladograms (definitions and differences).		Susanta Kumar Maity	
6	Unit 6: Phylogeny of Angiosperms Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating evolutionary relationship (phylogenetic tree, cladogram).		Susanta Kumar Maity	

Semester IV (AY 2021-2024)		Period: to		
Paper: CC10P (Plant Systematics) (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of vegetative and floral characters of the following	(36)	Susanta Kumar	

	<p>families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):</p> <ol style="list-style-type: none"> 1. Ranunculaceae - Ranunculus, Delphinium. 2. Brassicaceae - Brassica, Alyssum / Iberis. 3. Malvaceae – Sida Sp. Urenalobota. 4. Myrtaceae - Eucalyptus, Callistemon 5. Umbelliferae - Coriandrum /Anethum / Foeniculum. 6. Asteraceae - Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax. 7. Solanaceae - Solanum nigrum/Withania, Nicotina, Plumbaginefolia. 8. Lamiaceae - Salvia/Ocimum. 9. Euphorbiaceae - Euphorbia hirta/E.milii, Jatropha. 10. Fasaceae – TephrosiaSp.,Crotalaria Sp., 11. Caesalpineaeceae – Cassia Sp., 12. Asclepiadaeaceae- PesgulariaGygnema, 13. Apocynaceae – Hollorhen, Catharanthus. 14. Rubiaceae – Oldenladeae, Spermoeoceae, 15. Liliaceae - Asphodelus/Lilium/Allium. 16. Poaceae - Triticum/Hordeum/Avena. 	lectures)	Maity	
2	2. Field visit (local) – Subject to grant of funds from the university.		Susanta Kumar Maity	
3	3. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).		Susanta Kumar Maity	

Semester IV (AY 2021-2024)		Period: _____ to _____		
Paper: SEC2T (Mushroom Culture Technology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms.Types of edible mushrooms available in India - <i>Volvariellavolvacea</i> , <i>Pleurotuscitrinopileatus</i> , <i>Agaricusbisporus</i> .	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove,		Dr.Nilay Kumar	

	sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.		Maitra	
3	Unit 3: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.		Dr.Nilay Kumar Maitra	
4	Unit 4: Food Preparation:Types of foods prepared from mushroom.Research Centres - National level and Regional level.Cost benefit ratio - Marketing in India and abroad, Export Value.		Dr.Nilay Kumar Maitra	

Curriculum Plan (Botany Honours; CBCS)

Semester V (AY 2021-2024)		Period: to		
Paper: CC11T (Reproductive Biology of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction :History (contributions of G.B. Amici, W. Hofmeister, E. Strasburger, S.G. Nawaschin, P. Maheshwari, B.M. Johri, W.A. Jensen, J. Heslop-Harrison) and scope.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Reproductive development :Induction of flowering; flower as a modified determinate shoot. Flower development: genetic and molecular aspects.		Susanta Kumar Maity	
3	Unit 3: Anther and pollen biology Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Microgametogenesis; Pollen wall structure, MGU (male germ unit) structure, NPC system; Palynology and scope (a brief account); Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: Pseudomonads, polyads, massulae, pollinia.		Susanta Kumar Maity	
4	Unit 4: Ovule Structure; Types; Special structures–endothelium, obturator, aril, caruncle and hypostase; Female Gametophyte – megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis (details of <i>Polygonum</i> type); Organization and ultrastructure of mature embryo sac.		Susanta Kumar Maity	
5	Unit 5: Pollination and fertilization Pollination types and significance; adaptations; structure of stigma and style; path of pollen tube in pistil; double fertilization.		Susanta Kumar Maity	
6	Unit 6: Self incompatibility Basic concepts (interspecific, intraspecific, homomorphic, heteromorphic, GSI and SSI); Methods to overcome self- incompatibility: mixed pollination, bud pollination, stub pollination; Intra-ovarian and <i>in vitro</i> pollination; Modification of stigma surface, parasexual hybridization; Cybrids, <i>in vitro</i> fertilization.		Susanta Kumar Maity	
7	Unit 7: Embryo, Endosperm and Seed Structure and types; General pattern of development of dicot and monocot embryo and endosperm; Suspensor: structure and functions; Embryo-endosperm relationship; Nutrition of embryo; Unusual features; Embryo development in <i>Paonia</i> . Seed structure, importance and dispersal mechanisms		Susanta Kumar Maity	

8	Units 7: Polyembryony and apomixis Introduction; Classification; Causes and applications.		Susanta Kumar Maity	
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Semester V (AY 2021-2024)		Period: to		
Paper: CC11P (Reproductive Biology of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Anther: Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehisced anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation.	(40 lectures)	Susanta Kumar Maity	
2	2. Pollen grains: Fresh and acetolyzed showing ornamentation and aperture, pseudomonads, polyads, pollinia (slides/photographs, fresh material), ultrastructure of pollen wall (micrograph); Pollen viability: Tetrazolium test. germination: Calculation of percentage germination in different media using hanging drop method.		Susanta Kumar Maity	
3	3. Ovule: Types-anatropous, orthotropous, amphitropous/campylotropous, circinotropous, unitegmatic, bitegmatic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/specimens/photographs).		Susanta Kumar Maity	
4	4. Female gametophyte through permanent slides/ photographs: Types, ultrastructure of mature egg apparatus.		Susanta Kumar Maity	
5	5. Intra-ovarian pollination; Test tube pollination through photographs.		Susanta Kumar Maity	
6	6. Endosperm: Dissections of developing seeds for endosperm with free-nuclear haustoria.		Susanta Kumar Maity	
7	7. Embryogenesis: Study of development of dicot embryo through permanent slides; dissection of developing seeds for embryos at various developmental stages; Study of suspensor through electron micrographs		Susanta Kumar Maity	

Semester V (AY 2021-2024)		Period: to		
Paper: CC12T (Plant Physiology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Plant-water relations Water Potential and its components, water absorption by roots,	(60	Dr.Nilay Kumar	

	aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap – cohesion-tension theory. Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement.	lectures)	Maitra	
2	Unit 2: Mineral nutrition Essential and beneficial elements, macro and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents.		Dr.Nilay Kumar Maitra	
3	Unit 3: Nutrient Uptake Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, symport, antiport.		Dr.Nilay Kumar Maitra	
4	Unit 4: Translocation in the phloem Experimental evidence in support of phloem as the site of sugar translocation. Pressure–Flow Model; Phloem loading and unloading; Source–sink relationship.		Dr.Nilay Kumar Maitra	
5	Unit 5: Plant growth regulators Discovery, chemical nature (basic structure), bioassay and physiological roles of Auxin, Gibberellins, Cytokinin, Abscisic acid, Ethylene, Brassinosteroids and Jasmonic acid.		Dr.Nilay Kumar Maitra	
6	Unit 6: Physiology of flowering Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy.		Dr.Nilay Kumar Maitra	
7	Unit 7: Phytochrome , cryptochromes and phototropins Discovery, chemical nature, role in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action.		Dr.Nilay Kumar Maitra	

Semester V (AY 2021-2024)		Period: _____ to _____		
Paper: CC12P (Plant Physiology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Determination of osmotic potential of plant cell sap by plasmolytic method.	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Determination of water potential of given tissue (potato tuber) by weight method.		Dr.Nilay Kumar Maitra	
3	Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf.		Dr.Nilay Kumar Maitra	
4	Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophyte.		Dr.Nilay Kumar Maitra	
5	To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and xerophyte (both surfaces).		Dr.Nilay Kumar Maitra	
6	To study the phenomenon of seed germination (effect of light).		Dr.Nilay Kumar Maitra	
7	To study the effect of different concentrations of IAA on <i>Avenacoleoptile</i> elongation (IAA Bioassay).		Dr.Nilay Kumar Maitra	

8	To study the induction of amylase activity in germinating barley grains.		Dr.Nilay Kumar Maitra	
	Demonstration experiments			
	1. To demonstrate suction due to transpiration.		Dr.Nilay Kumar Maitra	
	2. Fruit ripening/Rooting from cuttings (Demonstration).		Dr.Nilay Kumar Maitra	
	3. Bolting experiment/ <i>Avenacoleptile</i> bioassay (demonstration).		Dr.Nilay Kumar Maitra	

Semester V (AY 2021-2024)		Period: to		
Paper: DSE1 (Biostatistics) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biostatistics Definition - statistical methods - basic principles. Variables - measurements, functions, limitations and uses of statistics.	(60 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Collection of data primary and secondary Types and methods of data collection procedures - merits and demerits. Classification - tabulation and presentation of data - sampling methods.		Dr.Nilay Kumar Maitra	
3	Unit 3: Measures of central tendency Mean, median, mode, geometric mean - merits & demerits. Measures of dispersion - range, standard deviation, mean deviation, quartile deviation - merits and demerits; Co-efficient of variations.		Dr.Nilay Kumar Maitra	
4	Unit 4: Correlation Types and methods of correlation, regression, simple regression equation, fitting prediction, similarities and dissimilarities of correlation and regression		Dr.Nilay Kumar Maitra	
5	Unit 5: Statistical inference Hypothesis - simple hypothesis - student 't' test - chi square test.		Dr.Nilay Kumar Maitra	

Semester V (AY 2021-2024)		Period: to		
Paper: DSE 1P (Biostatistics) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Calculation of mean, standard deviation and standard error	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Calculation of correlation coefficient values and finding out the probability		Dr.Nilay Kumar	

			Maitra	
3	Calculation of 'F' value and finding out the probability value for the F value.		Dr.Nilay Kumar Maitra	

Semester V (AY 2021-2024)		Period: to		
Paper: DSE2 (Plant Breeding) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Plant Breeding Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding.	(8 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Methods of crop improvement Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages and limitations.	(8 lectures)	Susanta Kumar Maity	
3	Unit 3: Quantitative inheritance Concept, mechanism, examples of inheritance of Kernel colour in wheat, Skin colour in human beings. Monogenic vs polygenic Inheritance.	(8 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Inbreeding depression and heterosis History, genetic basis of inbreeding depression and heterosis; Applications.	(8 lectures)	Susanta Kumar Maity	
5	Unit 5: Crop improvement and breeding Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.	(8 lectures)	SkMd Ismail Al Amin	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester VI (AY 2021-2024)		Period: _____ to _____		
Paper: CC13T (Plant Metabolism) (Theory)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Concept of metabolism Introduction, anabolic and catabolic pathways, regulation of metabolism, role of regulatory enzymes (allosteric ,covalent modulation and Isozymes).</p> <p>Unit 2: Carbon assimilation Historical background, photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, CO₂ reduction, photorespiration, C₄ pathways; Crassulacean acid metabolism; Factors affecting CO₂ reduction.</p> <p>Unit 3: Carbohydrate metabolism Synthesis and catabolism of sucrose and starch.</p> <p>Unit 4: Carbon Oxidation Glycolysis, fate of pyruvate, regulation of glycolysis, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, regulation of PDH, NADH shuttle; TCA cycle,amphibolic role, anaplerotic reactions, regulation of the cycle, mitochondrial electron transport, oxidative phosphorylation, cyanide-resistant respiration, factors affecting respiration.</p> <p>Unit 5: ATP-Synthesis Mechanism of ATP synthesis, substrate level phosphorylation, chemiosmotic mechanism (oxidative and photophosphorylation), ATP synthase, Boyers conformational model, Racker’s experiment, Jagendorf’s experiment; role of uncouplers.</p> <p>Unit 6: Lipid metabolism Synthesis and breakdown of triglycerides, β-oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilisation of lipids during seed germination, α oxidation</p> <p>Unit 7: Nitrogen metabolism Nitrate assimilation, biological nitrogen fixation (examples of legumes and non-legumes); Physiology and biochemistry of nitrogen fixation; Ammonia assimilation and transamination.</p> <p>Unit 8: Mechanisms of signal transduction Receptor-ligand interactions; Second messenger concept, Calcium calmodulin, MAP kinase cascade</p>	(60 lectures)	Dr.Nilay Kumar Maitra	

Semester VI (AY 2021-2024)		Period: to		
Paper: CC13P Plant Metabolism (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Chemical separation of photosynthetic pigments.</p> <p>2. Experimental demonstration of Hill's reaction.</p> <p>3. To study the effect of light intensity on the rate of photosynthesis.</p> <p>4. Effect of carbon dioxide on the rate of photosynthesis.</p> <p>5. To compare the rate of respiration in different parts of a plant.</p> <p>6. To demonstrate activity of Nitrate reductase in germinating leaves of different plant sources.</p> <p>7. To study the activity of lipases in germinating oilseeds and demonstrate mobilization of lipids 1. during germination.</p> <p>8. Demonstration of fluorescence by isolated chlorophyll pigments.</p> <p>9. Demonstration of absorption spectrum of photosynthetic pigments</p>	(35 lectures)	Dr.Nilay Kumar Maitra	

Semester VI (AY 2021-2024)		Period: to		
Paper: CC14T (Plant Biotechnology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit -1: Plant Tissue Culture Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation).</p> <p>Unit- 2: Recombinant DNA technology Restriction Endonucleases (History, Types I-IV, biological role and application);</p> <p>Unit - 5: Applications of Biotechnology Pest resistant (Bt-cotton); herbicide resistant plants (RoundUp Ready soybean); Transgenic crops with improved quality traits (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines; Industrial enzymes (Aspergillase, Protease, Lipase); Genetically Engineered Products–Human Growth Hormone; Humulin; Biosafety concerns.</p>	(30 lectures)	Susanta Kumar Maity	
2	<p>Unit- 2: Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda</p>	(30 lectures)	SkMd Ismail Al	

	phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC). Unit- 3: Gene Cloning Recombinant DNA, Bacterial Transformation and selection of recombinant clones, PCR-mediated gene cloning; Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; PCR Unit- 4: Methods of gene transfer Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).		Amin	
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Semester V (AY 2021-2024)		Period: _____ to _____		
Paper: CC14P (_____) (Practical)		Full Marks: _____ Credit: _____		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. (a) Preparation of MS medium. (b) Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc. 2. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs. 3. Isolation of protoplasts.	(16 lectures)	Susanta Kumar Maity	
2	4. Construction of restriction map of circular and linear DNA from the data provided. 5. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene 6. transfer by electroporation, microinjection, microprojectile bombardment. 7. Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs. 8. Isolation of plasmid DNA. 9. Restriction digestion and gel electrophoresis of plasmid DNA.	(16 lectures)	SkMd Ismail Al Amin	

Semester VI (AY 2021-2024)		Period: _____ to _____		
Paper: DSE3 (Industrial and Environmental Microbiology) (Theory)		Full Marks: _____ Credit: _____		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Scope of microbes in industry and environment Unit 2: Bioreactors/Fermenters and fermentation processes Solid-state and liquid-state (stationary and submerged) fermentations; Batch and continuous	(50 lectures)	SkMd Ismail Al Amin	

<p>fermentations. Components of a typical bioreactor, Types of bioreactors laboratory, pilotscale and production fermenters; Constantly stirred tank fermenter, tower fermenter, fixed bed and fluidized bed bioreactors and air-lift fermenter. A visit to any educational institute/ industry to see an industrial fermenter, and other downstream processing operations.</p> <p>Unit 3: Microbial production of industrial products Microorganisms involved, media, fermentation conditions, downstream processing and uses; Filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilization, spray drying; Hands on microbial fermentations for the production and estimation (qualitative and quantitative) of Enzyme: amylase or lipase activity, Organic acid (citric acid or glutamic acid), alcohol (Ethanol) and antibiotic (Penicillin)</p> <p>Unit 4: Microbial enzymes of industrial interest and enzyme immobilization Microorganisms for industrial applications and hands on screening microorganisms for casein hydrolysis; starch hydrolysis; cellulose hydrolysis. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase).</p> <p>Unit 5: Microbes and quality of environment. Distribution of microbes in air; Isolation of microorganisms from soil, air and water.</p> <p>Unit 6: Microbial flora of water. Water pollution, role of microbes in sewage and domestic waste water treatment systems. Determination of BOD, COD, TDS and TOC of water samples; Microorganisms as indicators of water quality, check coliform and fecal coliform in water samples.</p> <p>Unit 7: Microbes in agriculture and remediation of contaminated soils. Biological fixation; Mycorrhizae; Bioremediation of contaminated soils. Isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.</p>		&	Susanta Kumar Maity	
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Semester VI (AY 2021-2024)		Period: _____ to _____		
Paper: DSE3 (Industrial and Environmental Microbiology) (Practical)		Full Marks: _____ Credit: _____		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Principles and functioning of instruments in microbiology laboratory</p> <p>2. Hands on sterilization techniques and preparation of culture media.</p>	(30 lectures)	<p>SkMd Ismail Al Amin</p> <p>&</p> <p>Susanta Kumar Maity</p>	

Semester VI (AY 2021-2024)		Period: _____ to _____		
Paper: DSE4 (Analytical Techniques in Plant Sciences) (Theory)		Full Marks: _____ Credit: _____		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark

1	<p>Unit- 1: Imaging and related techniques Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.</p> <p>Unit- 2: Cell fractionation Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl₂ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.</p> <p>Unit- 3: Radioisotopes Use in biological research, autoradiography, pulse chase experiment.</p> <p>Unit- 4: Spectrophotometry Principle and its application in biological research.</p> <p>Unit- 5: Chromatography Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.</p> <p>Unit- 6: Characterization of proteins and nucleic acids Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE</p> <p>Unit- 7: Biostatistics Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.</p>	(50 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	
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Semester VI (AY 2021-2024)		Period: _____ to _____		
Paper: DSE4 (Analytical Techniques in Plant Sciences) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.</p> <p>2. Demonstration of ELISA.</p> <p>3. To separate nitrogenous bases by paper chromatography.</p> <p>4. To separate sugars by thin layer chromatography.</p> <p>5. Isolation of chloroplasts by differential centrifugation.</p>	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

	<p>6. To separate chloroplast pigments by column chromatography.</p> <p>7. To estimate protein concentration through Lowry's methods. 8. To separate proteins using PAGE.</p> <p>9. To separation DNA (marker) using AGE.</p> <p>10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).</p> <p>11. Preparation of permanent slides (double staining)</p>			
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**Curriculum Plan (ODD SEMESTER)
(Botany Honours; CBCS)**

Semester I (AY 2020-2023)		Period: to		
Paper: CC 1T(Phycology and Microbiology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to microbial world : Microbial nutrition, growth and metabolism. Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics, as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).	(7 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Viruses Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV).	(7 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Bacteria Discovery, general characteristics; Types-archaeobacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction).	(7 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Algae General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction; Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups) and Van – den Hoek et.al(1982); Significant contributions of important phycologists (F.E. Fritsch, G.M. Smith, R.N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P. Iyengar). Role of algae in the environment, agriculture, biotechnology and industry.	(11 lectures)	Susanta Kumar Maity	
5	Unit 5: Cyanophyta and Xanthophyta Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of Nostoc and Vaucheria.	(8 lectures)	Susanta Kumar Maity	
6	Unit 6: Chlorophyta and Charophyta General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Chlamydomonas</i> , <i>Volvox</i> , <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> . Evolutionary significance of <i>Prochloron</i> .	(8 lectures)	Susanta Kumar Maity	
7	Unit 7: Phaeophyta and Rhodophyta: Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> .	(12 lectures)	Susanta Kumar Maity	

Semester I (AY 2020-2023)		Period: to		
Paper: CC 1P (Phycology and Microbiology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark

1	Microbiology 1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle. 2. Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule. 3. Gram staining. 4. Endospore staining with malachite green using the (endospores taken from soil bacteria). 5. Study of bacteria from root nodules/Curd sample.	20	SkMd Ismail Al Amin	
2	Phycology Study of vegetative and reproductive structures of Nostoc, <i>Chlamydomonas</i> (electron micrographs), Volvox, <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> , <i>Prochloron</i> through electron micrographs, temporary preparations and permanent slides.	20	Susanta Kumar Maity	

Semester I (AY 2020-2023)		Period: to		
Paper: CC 2T (Biomolecules and Cell Biology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biomolecules: Types and significance of chemical bonds; Structure and properties of water; pH and buffers. Carbohydrates: Nomenclature and classification; Monosaccharides ; Disaccharides; Oligosaccharides and polysaccharides. Lipids: Definition and major classes of storage and structural lipids; Fatty acids structure and functions; Essential fatty acids; Triacylglycerols structure, functions and properties; Phosphoglycerides. Proteins: Structure of amino acids; Levels of protein structure-primary, secondary, tertiary and quaternary; Protein denaturation and biological roles of proteins. Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA; Structure of tRNA.	(20 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Bioenergetics : Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP: structure, its role as a energy currency molecule.	(4 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Enzymes: Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; Classification of enzymes; Features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation, enzyme inhibition and factors affecting enzyme activity.	(6 lectures)	Dr. Nilay Kumar Maitra	
4	Unit4: The cell: Cell as a unit of structure and function;	(4	Dr. Nilay	

7	7. Cytochemical staining of : DNA- Feulgen Actocarmin and AcetoOrcrin stain and cell wall in the epidermal peel of onion using Periodic Schiff's (PAS) staining technique.		Dr. Nilay Kumar Maitra	
8	8. Study the phenomenon of plasmolysis and deplasmolysis.		Dr. NilayKumar Maitra	
9	9. Study the effect of organic solvent and temperature on membrane permeability.		Dr. Nilay Kumar Maitra	
10	10. Study different stages of mitosis and meiosis.		Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester II (AY 2020-2023)		Period: _____ to _____		
Paper: CC 3T (Mycology and Phytopathology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to true fungi: General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification.	(6 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Chytridiomycota and Zygomycota: Characteristic features; Ecology and significance; Thallus organisation; Reproduction; Life cycle with reference to Synchytrium, Rhizopus .	(5 lecture)	Dr. Nilay Kumar Maitra	
3	Unit 3: Ascomycota: General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; Life cycle and classification with reference to Saccharomyces, Aspergillus, Penicillium, Alternaria, Neurospora and Peziza.	(10 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Basidiomycota :General characteristics; Ecology; Life cycle and Classification with reference to black stem rust on wheat Puccinia (Physiological Specialization), loose and covered smut (symptoms only), Agaricus; Bioluminescence, Fairy Rings and Mushroom Cultivation with special reference to Oyster Mashroom.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Allied Fungi: General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.	(3 lectures)	Dr. Nilay Kumar Maitra	
6	Unit 6: Oomycota: General characteristics; Ecology; Life cycle and classification with reference to Phytophthora, Albugo.	(4 lectures)	Dr. Nilay Kumar Maitra	
7	Unit 7: Symbiotic associations Lichen: – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction; Mycorrhiza-Ectomycorrhiza, Endomycorrhiza	(4 lectures)	Dr. Nilay Kumar Maitra	

	and their significance.			
8	Unit 8: Applied Mycology: Role of fungi in biotechnology; Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology.	(10 Lectures)	Dr. Nilay Kumar Maitra	
9	Unit 9: Phytopathology: Terms and concepts; General symptoms; Geographical distribution of diseases; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine.	(10 lectures)	Dr. Nilay Kumar Maitra	
10	Bacterial diseases :- Citrus canker and angular leaf spot of cotton. Viral diseases – Tobacco Mosaic viruses, vein clearing. Fungal diseases – Early blight of potato, Black stem rust of wheat, White rust of crucifers.	(10 lectures)	SkMdIsmail Al Amin	

Semester II (AY 2020-2023)		Period: to		
Paper: CC 3P(Mycology and Phytopathology)(Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Introduction to the world of fungi (Unicellular, coenocytic/septate mycelium, ascocarps&basidiocarps).	(30 lectures)	Dr. Nilay Kumar Maitra	
2	2. Rhizopus: study of asexual stage from temporary mounts and sexual structures through permanent slides.		Dr. Nilay Kumar Maitra	
3	3. Aspergillus and Penicillium: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.		Dr. Nilay Kumar Maitra	
4	4. Peziza: Ascobolus sectioning through ascocarp.		Dr. Nilay Kumar Maitra	
5	5. Alternaria: Specimens/photographs and temporary mounts.		Dr. Nilay Kumar Maitra	
6	6. Puccinia: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts.		Dr. Nilay Kumar Maitra	
7	7. Agaricus: Specimens of button stage and full grown mushroom; sectioning of gills of Agaricus, fairy rings and bioluminescent mushrooms to be shown.		Dr. Nilay Kumar Maitra	
8	8. Study of phaneroplasmodium from actual specimens and /or photograph. Study of Stemonitis sporangia.		Dr. Nilay Kumar Maitra	

9	9. Albugo: Study of symptoms of plants infected with Albugo; asexual phase study through section/ temporary mounts and sexual structures through permanent slides.		Dr. Nilay Kumar Maitra	
10	10. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs)		Dr. Nilay Kumar Maitra	
11	11. Phytopathology : Herbarium specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifers.	(10 lectures)	SkMd Ismail Al Amin	

Semester II (AY 2020-2023)		Period: _____ to _____		
Paper: CC 4T (Archegoniate) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction: Unifying features of archegoniate; Transition to land habit; Alternation of generations.	(4 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Bryophytes: General characteristics; Adaptations to land habit; Classification; Range of thallus organization.	(6 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Type Studies:- Bryophytes Classification (up to family), morphology, anatomy and reproduction of Riccia, Marchantia, Pellia, Porella, Anthoceros, Sphagnum and Funaria; Pogonatum, Reproduction and evolutionary trends in Riccia, Marchantia, Plagichasma Anthoceros and Funaria (developmental stages not included). Ecological and economic importance of bryophytes with special reference to Sphagnum.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Pteridophytes: General characteristics; Classification; Early land plants (Cooksonia and Rhynia).	(6 lectures)	Susanta Kumar Maity	
5	Unit 5: Type Studies:- Pteridophytes Classification (up to family), morphology, anatomy and reproduction of Psilotum, Selaginella, Equisetum and Pteris (Developmental details not to be included). Apogamy, and apospory, heterospory and seed habit, telome theory, stelar evolution; Ecological and economic importance.	(14 lectures)	Susanta Kumar Maity	
6	Unit 6: Gymnosperms: General characteristics, classification (up to family), morphology, anatomy and reproduction of Cycas, Pinus and Gnetum (Developmental details not to be included); Ecological and economic importance.	(18 lectures)	Susanta Kumar Maity	

Semester II (AY 2020-2023)		Period: _____ to _____		
Paper: CC 4P (Archegoniate) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Riccia – Morphology of thallus.	(15 lectures)		
2	2. Marchantia- Morphology of thallus, whole mount of rhizoids & Scales, vertical section of thallus through Gemma cup, whole mount of Gemmae (all temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte (all permanent slides).		SkMd Ismail Al Amin	
3	3. Anthoceros- Morphology of thallus, dissection of sporophyte (to show stomata, spores, pseudoelaters, columella) (temporary slide), vertical section of thallus (permanent slide).		SkMd Ismail Al Amin	
4	4. Pellia, Porella- Permanent slides.		SkMd Ismail Al Amin	
5	5. Sphagnum- Morphology of plant, whole mounts of leaf (permanent slide only).		SkMd Ismail Al Amin	
6	6. Funaria- Pogonatum/ Polytrichum Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, longitudinal section of capsule and protonema.		SkMd Ismail Al Amin	
7	7. Psilotum- Study of specimen, transverse section of synangium (permanent slide).	(15 lectures)	Susanta Kumar Maity	
8	8. Selaginella- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide).		Susanta Kumar Maity	
9	9. Equisetum- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (wet and dry) (temporary slide), transverse section of rhizome (permanent slide).		Susanta Kumar Maity	
10	10. Pteris- Morphology, transverse section of rachis, vertical section of sporophyll, whole mount of sporangium, whole mount of spores (temporary slides), transverse section of rhizome, whole mount of prothallus with sex organs and young sporophyte (permanent slide).		Susanta Kumar Maity	
11	11. Cycas- Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide).		Susanta Kumar Maity	
12	12. Pinus- Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), transverse section of Needle, transverse section of stem, longitudinal section of / transverse section of male cone, whole mount of microsporophyll, whole mount of Microspores (temporary slides), longitudinal section of female cone, tangential longitudinal section & radial longitudinal sections stem (permanent slide).		Susanta Kumar Maity	
13	13. Gnetum- Morphology (stem, male & female cones), transverse section of stem, vertical section of ovule (permanent slide)		Susanta Kumar Maity	

14	14. Botanical excursion		Susanta Kumar Maity	
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**Curriculum Plan (ODD SEMESTER)
(Botany Honours; CBCS)**

Semester III (AY 2020-2023)		Period: _____ to _____		
Paper: CC5T (Anatomy of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction and scope of Plant Anatomy: Applications in systematics, forensics and pharmacognosy.	(4 Lectures)	Susanta Kumar Maity	
2	Unit 2: Structure and Development of Plant Body Internal organization of plant body: The three tissue systems, types of cells and tissues. Development of plant body: polarity, cytodifferentiation and organogenesis during embryogenic development, Root-stem transition, Nodal anatomy – Basic concept.	(6 Lectures)	Susanta Kumar Maity	
3	Unit 3: Tissues Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation of tracheary elements and sieve elements; Pits and plasmodesmata; Wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts and laticifers.	(12 Lectures)	Susanta Kumar Maity	
4	Unit 4: Apical meristems: Evolution of concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory, continuing meristematic residue, cytohistological zonation); Types of vascular bundles; Structure of dicot and monocot stem. Origin, development, arrangement and diversity in size and shape of leaves; Structure of dicot and monocot leaf, Kranz anatomy. Organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe theory); Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin of lateral root.	(15 Lectures)	Susanta Kumar Maity	
5	Unit 5: Vascular Cambium and Wood Structure, function and seasonal activity of cambium; Secondary growth in root and stem. Anomalous secondary growth in Bignonia, Boerhaavia, Aristolochia and Dracaena. Axially and radially oriented elements; Types of rays and axial parenchyma; Cyclic aspects and reaction wood; Sapwood and heartwood; Ring and diffuse porous wood; Early and late wood, tyloses; Dendrochronology. Development and composition of periderm, rhytidome and lenticels.	(15 Lectures)	Susanta Kumar Maity	
6	Unit 6: Adaptive and Protective Systems Epidermal tissue system, cuticle, epicuticular waxes, trichomes(uni-and multicellular, glandular and nonglandular, two examples of each), stomata (classification); Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes. Mechanical tissue – distribution and significance.	(8 Lectures)	Susanta Kumar Maity	

Semester III (AY 2020-2023)		Period: to		
Paper: CC5P (Anatomy of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSE S ALLOTE D	Class taken by	Remark
1	<p>1. Study of anatomical details through permanent slides/temporary stain mounts/ macerations/museum specimens with the help of suitable examples.</p> <p>2. Apical meristem of root, shoot and vascular cambium</p> <p>3. Distribution and types of parenchyma, collenchyma and sclerenchyma.</p> <p>4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates; xylem fibres.</p> <p>5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood.</p> <p>6. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres.</p> <p>7. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular</p> <p>8. Root: monocot, dicot, secondary growth.</p> <p>9. Stem: monocot, dicot - primary and secondary growth; periderm; lenticels.</p> <p>10. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy).</p> <p>11. Adaptive Anatomy: xerophytes, hydrophytes.</p> <p>12. Secretory tissues: cavities, lithocysts and laticifers.</p>	(20 Lectur es)	Susanta Kumar Maity	

Semester III (AY 2020-2023)		Period: _____ to _____		
Paper: CC6T (Economic Botany) (Theory)		Full Marks: 40		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Origin of Cultivated Plants: Concept of Centres of Origin, their importance with reference to Vavilov’s work. Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity.</p> <p>Unit 2: Cereals: Wheat and Rice (origin, morphology, cultivation, management processing & uses); Brief account of millets.</p> <p>Unit 3: Legumes: Origin, morphology cultivation, management and uses of Chick pea, Pigeon pea and fodder legumes. Importance to man and ecosystem.</p> <p>Unit 4: Sources of sugars and starches: (Morphology cultivation, management and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, propagation & uses.</p> <p>Unit 5: Spices: Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper</p> <p>Unit 6: Beverages: Tea, Coffee (morphology, processing & uses)</p> <p>Unit 7: Sources of oils and fats :General description, classification, extraction, their uses and health implications groundnut, coconut, linseed, soybean, mustard and coconut (Botanical name, family & uses). Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.</p> <p>Unit 8: Natural Rubber: Para-rubber: tapping, processing and uses.</p> <p>Unit 9: Drug-yielding plants :Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Tobacco (Morphology, processing, uses and health hazards).</p> <p>Unit 10: Timber plants: General account with special reference to teak and pine.</p> <p>Unit 11: Fibers: Classification based on the origin of fibers; Cotton, Coir and Jute (morphology, extraction and uses).</p>	(60 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2020-2023)		Period: _____ to _____		
Paper: CC6P (Economic Botany) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Cereals: Wheat (habit sketch, L. S/T.S. grain, starch grains, micro-chemical tests) Rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests).</p> <p>2. Legumes: Soybean, Groundnut, (habit, fruit, seed structure, micro-chemical tests).</p> <p>3. Sources of sugars and starches: Sugarcane (habit sketch; cane juice-micro-chemical tests), Potato (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests).</p> <p>4. Spices: Black pepper, Fennel and Clove (habit and sections).</p> <p>5. Beverages: Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).</p> <p>6. Sources of oils and fats: Coconut- T.S. nut, Mustard-plant specimen, seeds; tests for fats in crushed seeds.</p> <p>7. Essential oil-yielding plants: Habit sketch of Rosa, Vetiveria, Santalum and Eucalyptus (specimens/photographs).</p> <p>8. Rubber: specimen, photograph/model of tapping, samples of rubber products.</p> <p>9. Drug-yielding plants: Specimens of Digitalis, Papaver and Cannabis.</p> <p>10. Tobacco: specimen and products of Tobacco.</p> <p>11. Woods: Tectona, Pinus: Specimen, Section of young stem.</p> <p>12. Fiber-yielding plants: Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).</p>	(24 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2020-2023)		Period: _____ to _____		
Paper: CC7T (Genetics) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Mendelian genetics and its extension Mendelism: History; Principles of inheritance; Chromosome theory of inheritance; Autosomes and sex chromosomes; Probability and pedigree analysis; Incomplete dominance and codominance; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Recessive and Dominant traits, Penetrance and Expressivity, Numericals; Polygenic inheritance.	(16 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Extrachromosomal Inheritance Chloroplast mutation: Variegation in Four o'clock plant; Mitochondrial mutations in yeast; Maternal effects-shell coiling in snail; Infective heredity- Kappa particles in Paramecium.	(6 lectures)	SkMd Ismail Al Amin	

3	Unit 3: Linkage, crossing over and chromosome mapping Linkage and crossing over-Cytological and molecular basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence; Numericals based on gene mapping; Sex Linkage.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Variation in chromosome number and structure Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy	(8 lectures)	SkMd Ismail Al Amin	
5	Unit 5: Gene mutations Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method. Role of Transposons in mutation.DNA repair mechanisms.	(6 lectures)	SkMd Ismail Al Amin	
6	Unit 6: Fine structure of gene Classical vs molecular concepts of gene; Cis-Trans complementation test for functional allelism; Structure of Phage T4, rII Locus.	(6 lectures)	SkMd Ismail Al Amin	
7	Unit 6. Population and Evolutionary Genetics Allele frequencies, Genotype frequencies, Hardy-Weinberg Law, role of natural selection, mutation, genetic drift. Genetic variation and Speciation.	(6 lectures)	SkMd Ismail Al Amin	

Semester III (AY 2020-2023)		Period: _____ to _____		
Paper: CC7P (Genetics) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Demonstration on pretreatment, fixation, staining and squash and smear preparation.	(40 lectures)	SkMd Ismail Al Amin	
2	2. Study of Mitosis from Onion / Garlic / Lentil root.		SkMd Ismail Al Amin	
3	3. Study of Meiosis with pollen mother cell (PMC) of Onion / Solanum / Datura by smear preparation.		SkMd Ismail Al Amin	
4	4. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.		SkMd Ismail Al Amin	
5	5. Chromosome mapping using point test cross data.		SkMd Ismail Al Amin	
6	6. Pedigree analysis for dominant and recessive autosomal and sex linked traits		SkMd Ismail Al Amin	
7	7. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).		SkMd Ismail Al Amin	
8	8. Blood Typing: groups & Rh factor.		SkMd Ismail Al Amin	

9	9. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.		SkMd Ismail Al Amin	
10	10. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.		SkMd Ismail Al Amin	
11	11. Study of human genetic traits: Sickle cell anemia, Xeroderma Pigmentosum, Albinism, red-green Colour blindness, Widow's peak, Rolling of tongue, Hitchhiker's thumb and Attached ear lobe		SkMd Ismail Al Amin	

Semester III (AY 2020-2023)		Period: to		
Paper: SEC1T (Biofertilizers) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.	(4 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.	(8 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.	(4 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.	(6 lectures)	Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester IV (AY 2020-2023)		Period: to		
Paper: CC8T (Molecular Biology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit- 1: Nucleic acids: Carriers of genetic information Historical perspective; DNA as the carrier of genetic information (Griffith's, Hershey	(60	SkMd Ismail	

	& Chase, Avery, McLeod & McCarty, Fraenkel-Conrat's experiment.	lectures)	Al Amin	
2	Unit -2. The Structures of DNA and RNA / Genetic Material DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves; Organization of DNA-Prokaryotes, Viruses, Eukaryotes. RNA Structure- Organelle DNA -- mitochondria and chloroplast DNA. The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin.			
3	Unit- 2: The replication of DNA Chemistry of DNA synthesis (Kornberg's discovery); General principles – bidirectional, semiconservative and semi discontinuous replication, RNA priming; Various models of DNA replication, including rolling circle, θ (theta) mode of replication, replication of linear ds-DNA, replication of the 5' end of linear chromosome; Enzymes involved in DNA replication.			
4	Unit- 3: Central dogma and genetic code Key experiments establishing- The Central Dogma (Adaptor hypothesis and discovery of mRNA template), Genetic code (deciphering & salient features)			
5	Unit 4: Transcription Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation; Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in E.coli. Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormones; Gene silencing.	(60 lectures)	Susanta Kumar Maity	
6	Unit 5: Processing and modification of RNA Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing (5' cap, 3' polyA tail); Ribozymes; RNA editing and mRNA transport.			
7	Unit 6: Translation Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins.			

Semester IV (AY 2020-2023)		Period: _____ to _____		
Paper: CC8P (Molecular Biology) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Preparation of LB medium and raising E.Coli.	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	
	2. Isolation of genomic DNA from <i>E. Coli</i> .			
	3. DNA isolation from cauliflower head.			
	4. DNA estimation by diphenylamine reagent/UV Spectrophotometry.			
	5. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).			
	6. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs			
	7. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)			
	8. Study of the following through photographs: Assembly of Spliceosome			

	machinery; Splicing mechanism in group I & group II introns; Ribozyme and Alternative splicing.			
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Semester IV (AY 2020-2023)		Period: to		
Paper: CC9T (Plant Ecology and Phytogeography) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Basic concepts; Levels of organization. Inter-relationships between the living world and the environment, the components and dynamism, homeostasis.	(60 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Soil Importance; Origin; Formation; Composition; Physical; Chemical and Biological components; Soil profile; Role of climate in soil development.		Dr. Nilay Kumar Maitra	
3	Unit 3: Water Importance: States of water in the environment; Atmospheric moisture; Precipitation types (rain, fog, snow, hail, dew); Hydrological Cycle; Water in soil; Water table.		Dr. Nilay Kumar Maitra	
4	Unit 4: Light, temperature, wind and fire Variations; adaptations of plants to their variation.		Dr. Nilay Kumar Maitra	
5	Unit 5: Ecosystems Structure; Processes; Trophic organisation; Food chains and Food webs; Ecological pyramids.		Dr. Nilay Kumar Maitra	
6	Unit 6: Population ecology Characteristics and Dynamics .Ecological Speciation		Dr. Nilay Kumar Maitra	
7	Unit 7: Plant communities Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts.		Dr. Nilay Kumar Maitra	
8	Unit 8: Biotic interactions Trophic organization, basic source of energy, autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop.		Dr. Nilay Kumar Maitra	
9	Unit 9: Functional aspects of ecosystem Principles and models of energy flow; Production and productivity; Ecological efficiencies; Biogeochemical cycles; Cycling of Carbon,		Dr. Nilay Kumar Maitra	

	Nitrogen and Phosphorus.			
10	Unit 10: Phytogeography Principles; Continental drift; Theory of tolerance; Endemism; Brief description of major terrestrial biomes (one each from tropical, temperate & tundra); Phytogeographical division of India; Local Vegetation.		Dr. Nilay Kumar Maitra	

Semester IV (AY 2020-2023)		Period: to		
Paper: CC9P (Plant Ecology and Phytogeography) (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	(36 lectures)	Dr. Nilay Kumar Maitra	
2	2. Determination of pH of various soil and water samples (pH meter, universal indicator/Lovibond comparator and pH paper)		Dr. Nilay Kumar Maitra	
3	3. Analysis for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency from		Dr. Nilay Kumar Maitra	
4	4. two soil samples by rapid field tests.		Dr. Nilay Kumar Maitra	
5	5. Determination of organic matter of different soil samples by Walkley& Black rapid titration		Dr. Nilay Kumar Maitra	
6	6. method		Dr. Nilay Kumar Maitra	
7	7. Comparison of bulk density, porosity and rate of infiltration of water in soils of three habitats.		Dr. Nilay Kumar Maitra	
8	8. Determination of dissolved oxygen of water samples from polluted and unpolluted sources.		Dr. Nilay Kumar Maitra	
9	9. (a). Study of morphological adaptations of hydrophytes and xerophytes (four each). (b). Study of biotic interactions of the following: Stem parasite (Cuscuta), Root parasite (Orobanchae) Epiphytes, Predation (Insectivorous plants).		Dr. Nilay Kumar Maitra	
10	10. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus, by species area curve method (species to be listed).		Dr. Nilay Kumar Maitra	
11	11. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law.		Dr. Nilay Kumar Maitra	

12	12. Quantitative analysis of herbaceous vegetation for density and abundance in the college campus. 13. Field visit to familiarise students with ecology of different sites.		Dr. Nilay Kumar Maitra	
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Semester IV (AY 2020-2023)		Period: to		
Paper: CC10T (Plant Systematics) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Significance of Plant systematics Introduction to systematics; Plant identification, Classification, Nomenclature. Evidences from palynology, cytology, phytochemistry and molecular data. Field inventory; Functions of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals; Keys: Single access and Multi-access.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Taxonomic hierarchy Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary).		Susanta Kumar Maity	
3	Unit 3: Botanical nomenclature Principles and rules (ICN); Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids.		Susanta Kumar Maity	
4	Unit 4: Systems of classification Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series); Brief reference of Angiosperm Phylogeny Group (APG III) classification.		Susanta Kumar Maity	
5	Unit 5: Biometrics, numerical taxonomy and cladistics Characters; Variations; OTUs, character weighting and coding; Cluster analysis; Phenograms, cladograms (definitions and differences).		Susanta Kumar Maity	
6	Unit 6: Phylogeny of Angiosperms Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating evolutionary relationship (phylogenetic tree, cladogram).		Susanta Kumar Maity	

Semester IV (AY 2020-2023)		Period: to		
Paper: CC10P (Plant Systematics) (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of vegetative and floral characters of the following	(36)	Susanta Kumar	

	<p>families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):</p> <ol style="list-style-type: none"> 1. Ranunculaceae - Ranunculus, Delphinium. 2. Brassicaceae - Brassica, Alyssum / Iberis. 3. Malvaceae – Sida Sp. Urenalobota. 4. Myrtaceae - Eucalyptus, Callistemon 5. Umbelliferae - Coriandrum /Anethum / Foeniculum. 6. Asteraceae - Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax. 7. Solanaceae - Solanum nigrum/Withania, Nicotina, Plumbaginefolia. 8. Lamiaceae - Salvia/Ocimum. 9. Euphorbiaceae - Euphorbia hirta/E.milii, Jatropha. 10. Fasaceae – TephrosiaSp.,Crotalaria Sp., 11. Caesalpineaeceae – Cassia Sp., 12. Asclepiadaeceae- PesgulariaGygnema, 13. Apocynaceae – Hollorhen, Catharanthus. 14. Rubiaceae – Oldenladeae, Spermoeoceae, 15. Liliaceae - Asphodelus/Lilium/Allium. 16. Poaceae - Triticum/Hordeum/Avena. 	lectures)	Maity	
2	2. Field visit (local) – Subject to grant of funds from the university.		Susanta Kumar Maity	
3	3. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).		Susanta Kumar Maity	

Semester IV (AY 2020-2023)		Period: _____ to _____		
Paper: SEC2T (Mushroom Culture Technology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms.Types of edible mushrooms available in India - <i>Volvariellavolvacea</i> , <i>Pleurotuscitrinopileatus</i> , <i>Agaricusbisporus</i> .	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove,		Dr.Nilay Kumar	

	sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.		Maitra	
3	Unit 3: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.		Dr.Nilay Kumar Maitra	
4	Unit 4: Food Preparation:Types of foods prepared from mushroom.Research Centres - National level and Regional level.Cost benefit ratio - Marketing in India and abroad, Export Value.		Dr.Nilay Kumar Maitra	

**ACADEMIC CALENDER
(Botany Honours; CBCS)**

Semester V (AY 2020-2023)		Period: _____ to _____		
Paper: CC11T (Reproductive Biology of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction :History (contributions of G.B. Amici, W. Hofmeister, E. Strasburger, S.G. Nawaschin, P. Maheshwari, B.M. Johri, W.A. Jensen, J. Heslop-Harrison) and scope.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Reproductive development :Induction of flowering; flower as a modified determinate shoot. Flower development: genetic and molecular aspects.		Susanta Kumar Maity	
3	Unit 3: Anther and pollen biology Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Microgametogenesis; Pollen wall structure, MGU (male germ unit) structure, NPC system; Palynology and scope (a brief account); Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: Pseudomonads, polyads, massulae, pollinia.		Susanta Kumar Maity	
4	Unit 4: Ovule Structure; Types; Special structures–endothelium, obturator, aril, caruncle and hypostase; Female Gametophyte – megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis (details of <i>Polygonum</i> type); Organization and ultrastructure of mature embryo sac.		Susanta Kumar Maity	
5	Unit 5: Pollination and fertilization Pollination types and significance; adaptations; structure of stigma and style; path of pollen tube in pistil; double fertilization.		Susanta Kumar Maity	
6	Unit 6: Self incompatibility Basic concepts (interspecific, intraspecific, homomorphic, heteromorphic, GSI and SSI); Methods to overcome self- incompatibility: mixed pollination, bud pollination, stub pollination; Intra-ovarian and <i>in vitro</i> pollination; Modification of stigma surface, parasexual hybridization; Cybrids, <i>in vitro</i> fertilization.		Susanta Kumar Maity	
7	Unit 7: Embryo, Endosperm and Seed Structure and types; General pattern of development of dicot and monocot embryo and endosperm; Suspensor: structure and functions; Embryo-endosperm relationship; Nutrition of embryo; Unusual features; Embryo development in <i>Paonia</i> . Seed structure, importance and dispersal mechanisms		Susanta Kumar Maity	

8	Units 7: Polyembryony and apomixis Introduction; Classification; Causes and applications.		Susanta Kumar Maity	
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Semester V (AY 2020-2023)		Period: _____ to _____		
Paper: CC11P (Reproductive Biology of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Anther: Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehisced anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation.	(40 lectures)	Susanta Kumar Maity	
2	2. Pollen grains: Fresh and acetolyzed showing ornamentation and aperture, pseudomonads, polyads, pollinia (slides/photographs, fresh material), ultrastructure of pollen wall (micrograph); Pollen viability: Tetrazolium test. germination: Calculation of percentage germination in different media using hanging drop method.		Susanta Kumar Maity	
3	3. Ovule: Types-anatropous, orthotropous, amphitropous/campylotropous, circinotropous, unitegmatic, bitegmatic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/specimens/photographs).		Susanta Kumar Maity	
4	4. Female gametophyte through permanent slides/ photographs: Types, ultrastructure of mature egg apparatus.		Susanta Kumar Maity	
5	5. Intra-ovarian pollination; Test tube pollination through photographs.		Susanta Kumar Maity	
6	6. Endosperm: Dissections of developing seeds for endosperm with free-nuclear haustoria.		Susanta Kumar Maity	
7	7. Embryogenesis: Study of development of dicot embryo through permanent slides; dissection of developing seeds for embryos at various developmental stages; Study of suspensor through electron micrographs		Susanta Kumar Maity	

Semester V (AY 2020-2023)		Period: _____ to _____		
Paper: CC12T (Plant Physiology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Plant-water relations Water Potential and its components, water absorption by roots,	(60	Dr.Nilay Kumar	

	aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap – cohesion-tension theory. Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement.	lectures)	Maitra	
2	Unit 2: Mineral nutrition Essential and beneficial elements, macro and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents.		Dr.Nilay Kumar Maitra	
3	Unit 3: Nutrient Uptake Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, symport, antiport.		Dr.Nilay Kumar Maitra	
4	Unit 4: Translocation in the phloem Experimental evidence in support of phloem as the site of sugar translocation. Pressure–Flow Model; Phloem loading and unloading; Source–sink relationship.		Dr.Nilay Kumar Maitra	
5	Unit 5: Plant growth regulators Discovery, chemical nature (basic structure), bioassay and physiological roles of Auxin, Gibberellins, Cytokinin, Abscisic acid, Ethylene, Brassinosteroids and Jasmonic acid.		Dr.Nilay Kumar Maitra	
6	Unit 6: Physiology of flowering Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy.		Dr.Nilay Kumar Maitra	
7	Unit 7: Phytochrome , cryptochromes and phototropins Discovery, chemical nature, role in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action.		Dr.Nilay Kumar Maitra	

Semester V (AY 2020-2023)		Period: _____ to _____		
Paper: CC12P (Plant Physiology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Determination of osmotic potential of plant cell sap by plasmolytic method.	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Determination of water potential of given tissue (potato tuber) by weight method.		Dr.Nilay Kumar Maitra	
3	Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf.		Dr.Nilay Kumar Maitra	
4	Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophyte.		Dr.Nilay Kumar Maitra	
5	To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and xerophyte (both surfaces).		Dr.Nilay Kumar Maitra	
6	To study the phenomenon of seed germination (effect of light).		Dr.Nilay Kumar Maitra	
7	To study the effect of different concentrations of IAA on <i>Avenacoleoptile</i> elongation (IAA Bioassay).		Dr.Nilay Kumar Maitra	

8	To study the induction of amylase activity in germinating barley grains.		Dr.Nilay Kumar Maitra	
	Demonstration experiments			
	1. To demonstrate suction due to transpiration.		Dr.Nilay Kumar Maitra	
	2. Fruit ripening/Rooting from cuttings (Demonstration).		Dr.Nilay Kumar Maitra	
	3. Bolting experiment/ <i>Avenacoleptile</i> bioassay (demonstration).		Dr.Nilay Kumar Maitra	

Semester V (AY 2020-2023)		Period: to		
Paper: DSE1 (Biostatistics) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biostatistics Definition - statistical methods - basic principles. Variables - measurements, functions, limitations and uses of statistics.	(60 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Collection of data primary and secondary Types and methods of data collection procedures - merits and demerits. Classification - tabulation and presentation of data - sampling methods.		Dr.Nilay Kumar Maitra	
3	Unit 3: Measures of central tendency Mean, median, mode, geometric mean - merits & demerits. Measures of dispersion - range, standard deviation, mean deviation, quartile deviation - merits and demerits; Co-efficient of variations.		Dr.Nilay Kumar Maitra	
4	Unit 4: Correlation Types and methods of correlation, regression, simple regression equation, fitting prediction, similarities and dissimilarities of correlation and regression		Dr.Nilay Kumar Maitra	
5	Unit 5: Statistical inference Hypothesis - simple hypothesis - student 't' test - chi square test.		Dr.Nilay Kumar Maitra	

Semester V (AY 2020-2023)		Period: to		
Paper: DSE 1P (Biostatistics) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Calculation of mean, standard deviation and standard error	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Calculation of correlation coefficient values and finding out the probability		Dr.Nilay Kumar	

			Maitra	
3	Calculation of 'F' value and finding out the probability value for the F value.		Dr.Nilay Kumar Maitra	

Semester V (AY 2020-2023)		Period: to		
Paper: DSE2 (Plant Breeding) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Plant Breeding Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding.	(8 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Methods of crop improvement Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages and limitations.	(8 lectures)	Susanta Kumar Maity	
3	Unit 3: Quantitative inheritance Concept, mechanism, examples of inheritance of Kernel colour in wheat, Skin colour in human beings. Monogenic vs polygenic Inheritance.	(8 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Inbreeding depression and heterosis History, genetic basis of inbreeding depression and heterosis; Applications.	(8 lectures)	Susanta Kumar Maity	
5	Unit 5: Crop improvement and breeding Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.	(8 lectures)	SkMd Ismail Al Amin	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester VI (AY 2020-2023)		Period: _____ to _____		
Paper: CC13T (Plant Metabolism) (Theory)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Concept of metabolism Introduction, anabolic and catabolic pathways, regulation of metabolism, role of regulatory enzymes (allosteric ,covalent modulation and Isozymes).</p> <p>Unit 2: Carbon assimilation Historical background, photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, CO₂ reduction, photorespiration, C₄ pathways; Crassulacean acid metabolism; Factors affecting CO₂ reduction.</p> <p>Unit 3: Carbohydrate metabolism Synthesis and catabolism of sucrose and starch.</p> <p>Unit 4: Carbon Oxidation Glycolysis, fate of pyruvate, regulation of glycolysis, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, regulation of PDH, NADH shuttle; TCA cycle,amphibolic role, anaplerotic reactions, regulation of the cycle, mitochondrial electron transport, oxidative phosphorylation, cyanide-resistant respiration, factors affecting respiration.</p> <p>Unit 5: ATP-Synthesis Mechanism of ATP synthesis, substrate level phosphorylation, chemiosmotic mechanism (oxidative and photophosphorylation), ATP synthase, Boyers conformational model, Racker’s experiment, Jagendorf’s experiment; role of uncouplers.</p> <p>Unit 6: Lipid metabolism Synthesis and breakdown of triglycerides, β-oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilisation of lipids during seed germination, α oxidation</p> <p>Unit 7: Nitrogen metabolism Nitrate assimilation, biological nitrogen fixation (examples of legumes and non-legumes); Physiology and biochemistry of nitrogen fixation; Ammonia assimilation and transamination.</p> <p>Unit 8: Mechanisms of signal transduction Receptor-ligand interactions; Second messenger concept, Calcium calmodulin, MAP kinase cascade</p>	(60 lectures)	Dr.Nilay Kumar Maitra	

Semester VI (AY 2020-2023)		Period: to		
Paper: CC13P Plant Metabolism (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Chemical separation of photosynthetic pigments.</p> <p>2. Experimental demonstration of Hill's reaction.</p> <p>3. To study the effect of light intensity on the rate of photosynthesis.</p> <p>4. Effect of carbon dioxide on the rate of photosynthesis.</p> <p>5. To compare the rate of respiration in different parts of a plant.</p> <p>6. To demonstrate activity of Nitrate reductase in germinating leaves of different plant sources.</p> <p>7. To study the activity of lipases in germinating oilseeds and demonstrate mobilization of lipids 1. during germination.</p> <p>8. Demonstration of fluorescence by isolated chlorophyll pigments.</p> <p>9. Demonstration of absorption spectrum of photosynthetic pigments</p>	(35 lectures)	Dr.Nilay Kumar Maitra	

Semester VI (AY 2020-2023)		Period: to		
Paper: CC14T (Plant Biotechnology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit -1: Plant Tissue Culture Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation).</p> <p>Unit- 2: Recombinant DNA technology Restriction Endonucleases (History, Types I-IV, biological role and application);</p> <p>Unit - 5: Applications of Biotechnology Pest resistant (Bt-cotton); herbicide resistant plants (RoundUp Ready soybean); Transgenic crops with improved</p>	(30 lectures)	Susanta Kumar Maity	

	quality traits (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines; Industrial enzymes (Aspergillase, Protease, Lipase); Genetically Engineered Products–Human Growth Hormone; Humulin; Biosafety concerns.			
2	<p>Unit- 2: Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC).</p> <p>Unit- 3: Gene Cloning Recombinant DNA, Bacterial Transformation and selection of recombinant clones, PCR mediated gene cloning; Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; PCR</p> <p>Unit- 4: Methods of gene transfer Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).</p>	(30 lectures)	SkMd Ismail Al Amin	

Semester V (AY 2020-2023)		Period: _____ to _____		
Paper: CC14P (_____) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. (a) Preparation of MS medium. (b) Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc.</p> <p>2. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs.</p> <p>3. Isolation of protoplasts.</p>	(16 lectures)	Susanta Kumar Maity	
2	<p>4. Construction of restriction map of circular and linear DNA from the data provided.</p> <p>5. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene</p> <p>6. transfer by electroporation, microinjection, microprojectile bombardment.</p> <p>7. Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs.</p> <p>8. Isolation of plasmid DNA.</p> <p>9. Restriction digestion and gel electrophoresis of plasmid DNA.</p>	(16 lectures)	SkMd Ismail Al Amin	

Semester VI (AY 2020-2023)		Period: _____ to _____		
Paper: DSE3 (Industrial and Environmental		Full Marks: _____		Credit: _____

Microbiology) (Theory)				
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Scope of microbes in industry and environment</p> <p>Unit 2: Bioreactors/Fermenters and fermentation processes Solid-state and liquid-state (stationary and submerged) fermentations; Batch and continuous fermentations. Components of a typical bioreactor, Types of bioreactors laboratory, pilotscale and production fermenters; Constantly stirred tank fermenter, tower fermenter, fixed bed and fluidized bed bioreactors and air-lift fermenter. A visit to any educational institute/ industry to see an industrial fermenter, and other downstream processing operations.</p> <p>Unit 3: Microbial production of industrial products Microorganisms involved, media, fermentation conditions, downstream processing and uses; Filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilization, spray drying; Hands on microbial fermentations for the production and estimation (qualitative and quantitative) of Enzyme: amylase or lipase activity, Organic acid (citric acid or glutamic acid), alcohol (Ethanol) and antibiotic (Penicillin)</p> <p>Unit 4: Microbial enzymes of industrial interest and enzyme immobilization Microorganisms for industrial applications and hands on screening microorganisms for casein hydrolysis; starch hydrolysis; cellulose hydrolysis. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase).</p> <p>Unit 5: Microbes and quality of environment. Distribution of microbes in air; Isolation of microorganisms from soil, air and water.</p> <p>Unit 6: Microbial flora of water. Water pollution, role of microbes in sewage and domestic waste water treatment systems. Determination of BOD, COD, TDS and TOC of water samples; Microorganisms as indicators of water quality, check coliform and fecal coliform in water samples.</p> <p>Unit 7: Microbes in agriculture and remediation of contaminated soils. Biological fixation; Mycorrhizae; Bioremediation of contaminated soils. Isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.</p>	(50 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2020-2023)		Period: to		
Paper: DSE3 (Industrial and Environmental Microbiology) (Practical)		Full Marks: Credit:		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Principles and functioning of instruments in microbiology laboratory</p> <p>2. Hands on sterilization techniques and preparation of culture media.</p>	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2020-2023)		Period: to		
Paper: DSE4 (Analytical Techniques in Plant Sciences) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit- 1: Imaging and related techniques Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.</p> <p>Unit- 2: Cell fractionation Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl₂ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.</p> <p>Unit- 3: Radioisotopes Use in biological research, autoradiography, pulse chase experiment.</p> <p>Unit- 4: Spectrophotometry Principle and its application in biological research.</p> <p>Unit- 5: Chromatography Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.</p> <p>Unit- 6: Characterization of proteins and nucleic acids Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE</p> <p>Unit- 7: Biostatistics Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.</p>	(50 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2020-2023)		Period: to		
Paper: DSE4 (Analytical Techniques in Plant Sciences) (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Study of Blotting techniques: Southern, Northern and Western, DNA	(30)	SkMd Ismail Al	

	<p>fingerprinting, DNA sequencing, PCR through photographs.</p> <p>2. Demonstration of ELISA.</p> <p>3. To separate nitrogenous bases by paper chromatography.</p> <p>4. To separate sugars by thin layer chromatography.</p> <p>5. Isolation of chloroplasts by differential centrifugation.</p> <p>6. To separate chloroplast pigments by column chromatography.</p> <p>7. To estimate protein concentration through Lowry's methods. 8. To separate proteins using PAGE.</p> <p>9. To separation DNA (marker) using AGE.</p> <p>10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).</p> <p>11. Preparation of permanent slides (double staining)</p>	lectures)	Amin & Susanta Kumar Maity	
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**Curriculum Plan (ODD SEMESTER)
(Botany Honours; CBCS)**

Semester I (AY 2019-2022)		Period: to		
Paper: CC 1T(Phycology and Microbiology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to microbial world : Microbial nutrition, growth and metabolism. Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics, as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).	(7 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Viruses Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV).	(7 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Bacteria Discovery, general characteristics; Types-archaeobacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction).	(7 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Algae General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction; Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups) and Van – den Hoek et.al(1982); Significant contributions of important phycologists (F.E. Fritsch, G.M. Smith, R.N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P. Iyengar). Role of algae in the environment, agriculture, biotechnology and industry.	(11 lectures)	Susanta Kumar Maity	
5	Unit 5: Cyanophyta and Xanthophyta Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of Nostoc and Vaucheria.	(8 lectures)	Susanta Kumar Maity	
6	Unit 6: Chlorophyta and Charophyta General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Chlamydomonas</i> , <i>Volvox</i> , <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> . Evolutionary significance of <i>Prochloron</i> .	(8 lectures)	Susanta Kumar Maity	
7	Unit 7: Phaeophyta and Rhodophyta: Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> .	(12 lectures)	Susanta Kumar Maity	

Semester I (AY 2019-2022)		Period: to		
Paper: CC 1P (Phycology and Microbiology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark

1	Microbiology 1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle. 2. Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule. 3. Gram staining. 4. Endospore staining with malachite green using the (endospores taken from soil bacteria). 5. Study of bacteria from root nodules/Curd sample.	20	SkMd Ismail Al Amin	
2	Phycology Study of vegetative and reproductive structures of Nostoc, <i>Chlamydomonas</i> (electron micrographs), Volvox, <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> , <i>Prochloron</i> through electron micrographs, temporary preparations and permanent slides.	20	Susanta Kumar Maity	

Semester I (AY 2019-2022)		Period: to		
Paper: CC 2T (Biomolecules and Cell Biology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biomolecules: Types and significance of chemical bonds; Structure and properties of water; pH and buffers. Carbohydrates: Nomenclature and classification; Monosaccharides ; Disaccharides; Oligosaccharides and polysaccharides. Lipids: Definition and major classes of storage and structural lipids; Fatty acids structure and functions; Essential fatty acids; Triacylglycerols structure, functions and properties; Phosphoglycerides. Proteins: Structure of amino acids; Levels of protein structure-primary, secondary, tertiary and quaternary; Protein denaturation and biological roles of proteins. Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA; Structure of tRNA.	(20 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Bioenergetics : Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP: structure, its role as a energy currency molecule.	(4 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Enzymes: Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; Classification of enzymes; Features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation, enzyme inhibition and factors affecting enzyme activity.	(6 lectures)	Dr. Nilay Kumar Maitra	
4	Unit4: The cell: Cell as a unit of structure and function;	(4	Dr. Nilay	

	Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory).	lectures)	Kumar Maitra	
5	Unit 5: Cell wall and plasma membrane: Chemistry, structure and function of Plant cell wall. Overview of membrane function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis.	(4 lectures)	Dr. Nilay Kumar Maitra	
6	Unit 6: Cell organelles: Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament. Chloroplast, mitochondria and peroxisomes: Structural organization; Function; Semiautonomous nature of mitochondria and chloroplast. Endomembrane system: Endoplasmic Reticulum – Structure, targeting and insertion of proteins in the ER, protein folding, processing; Smooth ER and lipid synthesis, export of proteins and lipids; Golgi Apparatus – organization, protein glycosylation, protein sorting and export from Golgi Apparatus; Lysosomes	(16 lectures)	Dr. Nilay Kumar Maitra	
7	Unit 7: Cell division: Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinases.	(6 lectures)	Dr. Nilay Kumar Maitra	

Semester I (AY 2019-2022)		Period: to		
Paper: CC 2P (: Biomolecules and Cell Biology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins.	(30 lectures)	Dr. Nilay Kumar Maitra	
2	2. Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo /Crinum.		Dr. Nilay Kumar Maitra	
3	3. Demonstration of the phenomenon of protoplasmic streaming in Hydrilla leaf.		Dr. Nilay Kumar Maitra	
4	4. Measurement of cell size by the technique of micrometry.		Dr. Nilay Kumar Maitra	
5	5. Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains).		Dr. Nilay Kumar Maitra	
6	6. Study of cell and its organelles with the help of electron micrographs.		Dr. Nilay Kumar Maitra	

7	7. Cytochemical staining of : DNA- Feulgen Actocarmin and AcetoOrcrin stain and cell wall in the epidermal peel of onion using Periodic Schiff's (PAS) staining technique.		Dr. Nilay Kumar Maitra	
8	8. Study the phenomenon of plasmolysis and deplasmolysis.		Dr. NilayKumar Maitra	
9	9. Study the effect of organic solvent and temperature on membrane permeability.		Dr. Nilay Kumar Maitra	
10	10. Study different stages of mitosis and meiosis.		Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester II (AY 2019-2022)		Period: _____ to _____		
Paper: CC 3T (Mycology and Phytopathology) (Theory)		Full Marks: 40	Credit:04	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to true fungi: General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification.	(6 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Chytridiomycota and Zygomycota: Characteristic features; Ecology and significance; Thallus organisation; Reproduction; Life cycle with reference to Synchytrium, Rhizopus .	(5 lecture)	Dr. Nilay Kumar Maitra	
3	Unit 3: Ascomycota: General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; Life cycle and classification with reference to Saccharomyces, Aspergillus, Penicillium, Alternaria, Neurospora and Peziza.	(10 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Basidiomycota :General characteristics; Ecology; Life cycle and Classification with reference to black stem rust on wheat Puccinia (Physiological Specialization), loose and covered smut (symptoms only), Agaricus; Bioluminescence, Fairy Rings and Mushroom Cultivation with special reference to Oyster Mashroom.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Allied Fungi: General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.	(3 lectures)	Dr. Nilay Kumar Maitra	
6	Unit 6: Oomycota: General characteristics; Ecology; Life cycle and classification with reference to Phytophthora, Albugo.	(4 lectures)	Dr. Nilay Kumar Maitra	
7	Unit 7: Symbiotic associations Lichen: – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction; Mycorrhiza-Ectomycorrhiza, Endomycorrhiza	(4 lectures)	Dr. Nilay Kumar Maitra	

9	9. Albugo: Study of symptoms of plants infected with Albugo; asexual phase study through section/ temporary mounts and sexual structures through permanent slides.		Dr. Nilay Kumar Maitra	
10	10. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs)		Dr. Nilay Kumar Maitra	
11	11. Phytopathology : Herbarium specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifers.	(10 lectures)	SkMd Ismail Al Amin	

Semester II (AY 2019-2022)		Period: _____ to _____		
Paper: CC 4T (Archegoniate) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction: Unifying features of archegoniate; Transition to land habit; Alternation of generations.	(4 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Bryophytes: General characteristics; Adaptations to land habit; Classification; Range of thallus organization.	(6 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Type Studies:- Bryophytes Classification (up to family), morphology, anatomy and reproduction of Riccia, Marchantia, Pellia, Porella, Anthoceros, Sphagnum and Funaria; Pogonatum, Reproduction and evolutionary trends in Riccia, Marchantia, Plagichasma Anthoceros and Funaria (developmental stages not included). Ecological and economic importance of bryophytes with special reference to Sphagnum.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Pteridophytes: General characteristics; Classification; Early land plants (Cooksonia and Rhynia).	(6 lectures)	Susanta Kumar Maity	
5	Unit 5: Type Studies:- Pteridophytes Classification (up to family), morphology, anatomy and reproduction of Psilotum, Selaginella, Equisetum and Pteris (Developmental details not to be included). Apogamy, and apospory, heterospory and seed habit, telome theory, stelar evolution; Ecological and economic importance.	(14 lectures)	Susanta Kumar Maity	
6	Unit 6: Gymnosperms: General characteristics, classification (up to family), morphology, anatomy and reproduction of Cycas, Pinus and Gnetum (Developmental details not to be included); Ecological and economic importance.	(18 lectures)	Susanta Kumar Maity	

Semester II (AY 2019-2022)		Period: _____ to _____		
Paper: CC 4P (Archegoniate) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Riccia – Morphology of thallus.	(15 lectures)		
2	2. Marchantia- Morphology of thallus, whole mount of rhizoids & Scales, vertical section of thallus through Gemma cup, whole mount of Gemmae (all temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte (all permanent slides).		SkMd Ismail Al Amin	
3	3. Anthoceros- Morphology of thallus, dissection of sporophyte (to show stomata, spores, pseudoelaters, columella) (temporary slide), vertical section of thallus (permanent slide).		SkMd Ismail Al Amin	
4	4. Pellia, Porella- Permanent slides.		SkMd Ismail Al Amin	
5	5. Sphagnum- Morphology of plant, whole mounts of leaf (permanent slide only).		SkMd Ismail Al Amin	
6	6. Funaria- Pogonatum/ Polytrichum Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, longitudinal section of capsule and protonema.		SkMd Ismail Al Amin	
7	7. Psilotum- Study of specimen, transverse section of synangium (permanent slide).	(15 lectures)	Susanta Kumar Maity	
8	8. Selaginella- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide).		Susanta Kumar Maity	
9	9. Equisetum- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (wet and dry) (temporary slide), transverse section of rhizome (permanent slide).		Susanta Kumar Maity	
10	10. Pteris- Morphology, transverse section of rachis, vertical section of sporophyll, whole mount of sporangium, whole mount of spores (temporary slides), transverse section of rhizome, whole mount of prothallus with sex organs and young sporophyte (permanent slide).		Susanta Kumar Maity	
11	11. Cycas- Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide).		Susanta Kumar Maity	
12	12. Pinus- Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), transverse section of Needle, transverse section of stem, longitudinal section of / transverse section of male cone, whole mount of microsporophyll, whole mount of Microspores (temporary slides), longitudinal section of female cone, tangential longitudinal section & radial longitudinal sections stem (permanent slide).		Susanta Kumar Maity	
13	13. Gnetum- Morphology (stem, male & female cones), transverse section of stem, vertical section of ovule (permanent slide)		Susanta Kumar Maity	

14	14. Botanical excursion		Susanta Kumar Maity	
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**Curriculum Plan (ODD SEMESTER)
(Botany Honours; CBCS)**

Semester III (AY 2019-2022)		Period: _____ to _____		
Paper: CC5T (Anatomy of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction and scope of Plant Anatomy: Applications in systematics, forensics and pharmacognosy.	(4 Lectures)	Susanta Kumar Maity	
2	Unit 2: Structure and Development of Plant Body Internal organization of plant body: The three tissue systems, types of cells and tissues. Development of plant body: polarity, cytodifferentiation and organogenesis during embryogenic development, Root-stem transition, Nodal anatomy – Basic concept.	(6 Lectures)	Susanta Kumar Maity	
3	Unit 3: Tissues Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation of tracheary elements and sieve elements; Pits and plasmodesmata; Wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts and laticifers.	(12 Lectures)	Susanta Kumar Maity	
4	Unit 4: Apical meristems: Evolution of concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory, continuing meristematic residue, cytohistological zonation); Types of vascular bundles; Structure of dicot and monocot stem. Origin, development, arrangement and diversity in size and shape of leaves; Structure of dicot and monocot leaf, Kranz anatomy. Organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe theory); Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin of lateral root.	(15 Lectures)	Susanta Kumar Maity	
5	Unit 5: Vascular Cambium and Wood Structure, function and seasonal activity of cambium; Secondary growth in root and stem. Anomalous secondary growth in Bignonia, Boerhaavia, Aristolochia and Dracaena. Axially and radially oriented elements; Types of rays and axial parenchyma; Cyclic aspects and reaction wood; Sapwood and heartwood; Ring and diffuse porous wood; Early and late wood, tyloses; Dendrochronology. Development and composition of periderm, rhytidome and lenticels.	(15 Lectures)	Susanta Kumar Maity	
6	Unit 6: Adaptive and Protective Systems Epidermal tissue system, cuticle, epicuticular waxes, trichomes(uni-and multicellular, glandular and nonglandular, two examples of each), stomata (classification); Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes. Mechanical tissue – distribution and significance.	(8 Lectures)	Susanta Kumar Maity	

Semester III (AY 2019-2022)		Period: to		
Paper: CC5P (Anatomy of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSE S ALLOTE D	Class taken by	Remark
1	<p>1. Study of anatomical details through permanent slides/temporary stain mounts/ macerations/museum specimens with the help of suitable examples.</p> <p>2. Apical meristem of root, shoot and vascular cambium</p> <p>3. Distribution and types of parenchyma, collenchyma and sclerenchyma.</p> <p>4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates; xylem fibres.</p> <p>5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood.</p> <p>6. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres.</p> <p>7. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular</p> <p>8. Root: monocot, dicot, secondary growth.</p> <p>9. Stem: monocot, dicot - primary and secondary growth; periderm; lenticels.</p> <p>10. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy).</p> <p>11. Adaptive Anatomy: xerophytes, hydrophytes.</p> <p>12. Secretory tissues: cavities, lithocysts and laticifers.</p>	(20 Lectur es)	Susanta Kumar Maity	

Semester III (AY 2019-2022)		Period: _____ to _____		
Paper: CC6T (Economic Botany) (Theory)		Full Marks: 40		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Origin of Cultivated Plants: Concept of Centres of Origin, their importance with reference to Vavilov’s work. Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity.</p> <p>Unit 2: Cereals: Wheat and Rice (origin, morphology, cultivation, management processing & uses); Brief account of millets.</p> <p>Unit 3: Legumes: Origin, morphology cultivation, management and uses of Chick pea, Pigeon pea and fodder legumes. Importance to man and ecosystem.</p> <p>Unit 4: Sources of sugars and starches: (Morphology cultivation, management and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, propagation & uses.</p> <p>Unit 5: Spices: Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper</p> <p>Unit 6: Beverages: Tea, Coffee (morphology, processing & uses)</p> <p>Unit 7: Sources of oils and fats :General description, classification, extraction, their uses and health implications groundnut, coconut, linseed, soybean, mustard and coconut (Botanical name, family & uses). Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.</p> <p>Unit 8: Natural Rubber: Para-rubber: tapping, processing and uses.</p> <p>Unit 9: Drug-yielding plants :Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Tobacco (Morphology, processing, uses and health hazards).</p> <p>Unit 10: Timber plants: General account with special reference to teak and pine.</p> <p>Unit 11: Fibers: Classification based on the origin of fibers; Cotton, Coir and Jute (morphology, extraction and uses).</p>	(60 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2019-2022)		Period: _____ to _____		
Paper: CC6P (Economic Botany) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Cereals: Wheat (habit sketch, L. S/T.S. grain, starch grains, micro-chemical tests) Rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests).</p> <p>2. Legumes: Soybean, Groundnut, (habit, fruit, seed structure, micro-chemical tests).</p> <p>3. Sources of sugars and starches: Sugarcane (habit sketch; cane juice-micro-chemical tests), Potato (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests).</p> <p>4. Spices: Black pepper, Fennel and Clove (habit and sections).</p> <p>5. Beverages: Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).</p> <p>6. Sources of oils and fats: Coconut- T.S. nut, Mustard-plant specimen, seeds; tests for fats in crushed seeds.</p> <p>7. Essential oil-yielding plants: Habit sketch of Rosa, Vetiveria, Santalum and Eucalyptus (specimens/photographs).</p> <p>8. Rubber: specimen, photograph/model of tapping, samples of rubber products.</p> <p>9. Drug-yielding plants: Specimens of Digitalis, Papaver and Cannabis.</p> <p>10. Tobacco: specimen and products of Tobacco.</p> <p>11. Woods: Tectona, Pinus: Specimen, Section of young stem.</p> <p>12. Fiber-yielding plants: Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).</p>	(24 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2019-2022)		Period: _____ to _____		
Paper: CC7T (Genetics) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Mendelian genetics and its extension Mendelism: History; Principles of inheritance; Chromosome theory of inheritance; Autosomes and sex chromosomes; Probability and pedigree analysis; Incomplete dominance and codominance; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Recessive and Dominant traits, Penetrance and Expressivity, Numericals; Polygenic inheritance.	(16 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Extrachromosomal Inheritance Chloroplast mutation: Variegation in Four o'clock plant; Mitochondrial mutations in yeast; Maternal effects-shell coiling in snail; Infective heredity- Kappa particles in Paramecium.	(6 lectures)	SkMd Ismail Al Amin	

3	Unit 3: Linkage, crossing over and chromosome mapping Linkage and crossing over-Cytological and molecular basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence; Numericals based on gene mapping; Sex Linkage.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Variation in chromosome number and structure Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy	(8 lectures)	SkMd Ismail Al Amin	
5	Unit 5: Gene mutations Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method. Role of Transposons in mutation.DNA repair mechanisms.	(6 lectures)	SkMd Ismail Al Amin	
6	Unit 6: Fine structure of gene Classical vs molecular concepts of gene; Cis-Trans complementation test for functional allelism; Structure of Phage T4, rII Locus.	(6 lectures)	SkMd Ismail Al Amin	
7	Unit 6. Population and Evolutionary Genetics Allele frequencies, Genotype frequencies, Hardy-Weinberg Law, role of natural selection, mutation, genetic drift. Genetic variation and Speciation.	(6 lectures)	SkMd Ismail Al Amin	

Semester III (AY 2019-2022)		Period: _____ to _____		
Paper: CC7P (Genetics) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Demonstration on pretreatment, fixation, staining and squash and smear preparation.	(40 lectures)	SkMd Ismail Al Amin	
2	2. Study of Mitosis from Onion / Garlic / Lentil root.		SkMd Ismail Al Amin	
3	3. Study of Meiosis with pollen mother cell (PMC) of Onion / Solanum / Datura by smear preparation.		SkMd Ismail Al Amin	
4	4. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.		SkMd Ismail Al Amin	
5	5. Chromosome mapping using point test cross data.		SkMd Ismail Al Amin	
6	6. Pedigree analysis for dominant and recessive autosomal and sex linked traits		SkMd Ismail Al Amin	
7	7. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).		SkMd Ismail Al Amin	
8	8. Blood Typing: groups & Rh factor.		SkMd Ismail Al Amin	

9	9. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.		SkMd Ismail Al Amin	
10	10. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.		SkMd Ismail Al Amin	
11	11. Study of human genetic traits: Sickle cell anemia, Xeroderma Pigmentosum, Albinism, red-green Colour blindness, Widow's peak, Rolling of tongue, Hitchhiker's thumb and Attached ear lobe		SkMd Ismail Al Amin	

Semester III (AY 2019-2022)		Period: to		
Paper: SEC1T (Biofertilizers) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.	(4 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.	(8 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.	(4 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.	(6 lectures)	Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester IV (AY 2019-2022)		Period: to		
Paper: CC8T (Molecular Biology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit- 1: Nucleic acids: Carriers of genetic information Historical perspective; DNA as the carrier of genetic information (Griffith's, Hershey	(60	SkMd Ismail	

	& Chase, Avery, McLeod & McCarty, Fraenkel-Conrat's experiment.	lectures)	Al Amin	
2	Unit -2. The Structures of DNA and RNA / Genetic Material DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves; Organization of DNA-Prokaryotes, Viruses, Eukaryotes. RNA Structure- Organelle DNA -- mitochondria and chloroplast DNA. The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin.			
3	Unit- 2: The replication of DNA Chemistry of DNA synthesis (Kornberg's discovery); General principles – bidirectional, semiconservative and semi discontinuous replication, RNA priming; Various models of DNA replication, including rolling circle, θ (theta) mode of replication, replication of linear ds-DNA, replication of the 5' end of linear chromosome; Enzymes involved in DNA replication.			
4	Unit- 3: Central dogma and genetic code Key experiments establishing- The Central Dogma (Adaptor hypothesis and discovery of mRNA template), Genetic code (deciphering & salient features)			
5	Unit 4: Transcription Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation; Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in E.coli. Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormones; Gene silencing.	(60 lectures)	Susanta Kumar Maity	
6	Unit 5: Processing and modification of RNA Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing (5' cap, 3' polyA tail); Ribozymes; RNA editing and mRNA transport.			
7	Unit 6: Translation Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins.			

Semester IV (AY 2019-2022)		Period: _____ to _____		
Paper: CC8P (Molecular Biology) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Preparation of LB medium and raising E.Coli.	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	
	2. Isolation of genomic DNA from <i>E. Coli</i> .			
	3. DNA isolation from cauliflower head.			
	4. DNA estimation by diphenylamine reagent/UV Spectrophotometry.			
	5. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).			
	6. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs			
	7. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)			
	8. Study of the following through photographs: Assembly of Spliceosome			

	machinery; Splicing mechanism in group I & group II introns; Ribozyme and Alternative splicing.			
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Semester IV (AY 2019-2022)		Period: to		
Paper: CC9T (Plant Ecology and Phytogeography) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Basic concepts; Levels of organization. Inter-relationships between the living world and the environment, the components and dynamism, homeostasis.	(60 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Soil Importance; Origin; Formation; Composition; Physical; Chemical and Biological components; Soil profile; Role of climate in soil development.		Dr. Nilay Kumar Maitra	
3	Unit 3: Water Importance: States of water in the environment; Atmospheric moisture; Precipitation types (rain, fog, snow, hail, dew); Hydrological Cycle; Water in soil; Water table.		Dr. Nilay Kumar Maitra	
4	Unit 4: Light, temperature, wind and fire Variations; adaptations of plants to their variation.		Dr. Nilay Kumar Maitra	
5	Unit 5: Ecosystems Structure; Processes; Trophic organisation; Food chains and Food webs; Ecological pyramids.		Dr. Nilay Kumar Maitra	
6	Unit 6: Population ecology Characteristics and Dynamics .Ecological Speciation		Dr. Nilay Kumar Maitra	
7	Unit 7: Plant communities Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts.		Dr. Nilay Kumar Maitra	
8	Unit 8: Biotic interactions Trophic organization, basic source of energy, autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop.		Dr. Nilay Kumar Maitra	
9	Unit 9: Functional aspects of ecosystem Principles and models of energy flow; Production and productivity; Ecological efficiencies; Biogeochemical cycles; Cycling of Carbon,		Dr. Nilay Kumar Maitra	

	Nitrogen and Phosphorus.			
10	Unit 10: Phytogeography Principles; Continental drift; Theory of tolerance; Endemism; Brief description of major terrestrial biomes (one each from tropical, temperate & tundra); Phytogeographical division of India; Local Vegetation.		Dr. Nilay Kumar Maitra	

Semester IV (AY 2019-2022)		Period: to		
Paper: CC9P (Plant Ecology and Phytogeography) (Practical)		Full Marks: Credit:		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	(36 lectures)	Dr. Nilay Kumar Maitra	
2	2. Determination of pH of various soil and water samples (pH meter, universal indicator/Lovibond comparator and pH paper)		Dr. Nilay Kumar Maitra	
3	3. Analysis for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency from		Dr. Nilay Kumar Maitra	
4	4. two soil samples by rapid field tests.		Dr. Nilay Kumar Maitra	
5	5. Determination of organic matter of different soil samples by Walkley& Black rapid titration		Dr. Nilay Kumar Maitra	
6	6. method		Dr. Nilay Kumar Maitra	
7	7. Comparison of bulk density, porosity and rate of infiltration of water in soils of three habitats.		Dr. Nilay Kumar Maitra	
8	8. Determination of dissolved oxygen of water samples from polluted and unpolluted sources.		Dr. Nilay Kumar Maitra	
9	9. (a). Study of morphological adaptations of hydrophytes and xerophytes (four each). (b). Study of biotic interactions of the following: Stem parasite (Cuscuta), Root parasite (Orobanchae) Epiphytes, Predation (Insectivorous plants).		Dr. Nilay Kumar Maitra	
10	10. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus, by species area curve method (species to be listed).		Dr. Nilay Kumar Maitra	
11	11. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law.		Dr. Nilay Kumar Maitra	

12	12. Quantitative analysis of herbaceous vegetation for density and abundance in the college campus. 13. Field visit to familiarise students with ecology of different sites.		Dr. Nilay Kumar Maitra	
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Semester IV (AY 2019-2022)		Period: to		
Paper: CC10T (Plant Systematics) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Significance of Plant systematics Introduction to systematics; Plant identification, Classification, Nomenclature. Evidences from palynology, cytology, phytochemistry and molecular data. Field inventory; Functions of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals; Keys:Single access and Multi-access.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Taxonomic hierarchy Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary).		Susanta Kumar Maity	
3	Unit 3: Botanical nomenclature Principles and rules (ICN); Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids.		Susanta Kumar Maity	
4	Unit 4: Systems of classification Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series); Brief reference of Angiosperm Phylogeny Group (APG III) classification.		Susanta Kumar Maity	
5	Unit 5: Biometrics, numerical taxonomy and cladistics Characters; Variations; OTUs, character weighting and coding; Cluster analysis; Phenograms, cladograms (definitions and differences).		Susanta Kumar Maity	
6	Unit 6: Phylogeny of Angiosperms Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating evolutionary relationship (phylogenetic tree, cladogram).		Susanta Kumar Maity	

Semester IV (AY 2019-2022)		Period: to		
Paper: CC10P (Plant Systematics) (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of vegetative and floral characters of the following	(36)	Susanta Kumar	

	<p>families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):</p> <ol style="list-style-type: none"> 1. Ranunculaceae - Ranunculus, Delphinium. 2. Brassicaceae - Brassica, Alyssum / Iberis. 3. Malvaceae – Sida Sp. Urenalobota. 4. Myrtaceae - Eucalyptus, Callistemon 5. Umbelliferae - Coriandrum /Anethum / Foeniculum. 6. Asteraceae - Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax. 7. Solanaceae - Solanum nigrum/Withania, Nicotina, Plumbaginefolia. 8. Lamiaceae - Salvia/Ocimum. 9. Euphorbiaceae - Euphorbia hirta/E.milii, Jatropha. 10. Fasaceae – TephrosiaSp.,Crotalaria Sp., 11. Caesalpineaeceae – Cassia Sp., 12. Asclepiadaeceae- PesgulariaGygnema, 13. Apocynaceae – Hollorhen, Catharanthus. 14. Rubiaceae – Oldenladeae, Spermoeoceae, 15. Liliaceae - Asphodelus/Lilium/Allium. 16. Poaceae - Triticum/Hordeum/Avena. 	lectures)	Maity	
2	2. Field visit (local) – Subject to grant of funds from the university.		Susanta Kumar Maity	
3	3. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).		Susanta Kumar Maity	

Semester IV (AY 2019-2022)		Period: _____ to _____		
Paper: SEC2T (Mushroom Culture Technology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms.Types of edible mushrooms available in India - <i>Volvariellavolvacea</i> , <i>Pleurotuscitrinopileatus</i> , <i>Agaricusbisporus</i> .	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove,		Dr.Nilay Kumar	

	sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.		Maitra	
3	Unit 3: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickles, papads), drying, storage in salt solutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.		Dr.Nilay Kumar Maitra	
4	Unit 4: Food Preparation: Types of foods prepared from mushroom. Research Centres - National level and Regional level. Cost benefit ratio - Marketing in India and abroad, Export Value.		Dr.Nilay Kumar Maitra	

Curriculum Plan (Botany Honours; CBCS)

Semester V (AY 2019-2022)		Period: _____ to _____		
Paper: CC11T (Reproductive Biology of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction :History (contributions of G.B. Amici, W. Hofmeister, E. Strasburger, S.G. Nawaschin, P. Maheshwari, B.M. Johri, W.A. Jensen, J. Heslop-Harrison) and scope.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Reproductive development :Induction of flowering; flower as a modified determinate shoot. Flower development: genetic and molecular aspects.		Susanta Kumar Maity	
3	Unit 3: Anther and pollen biology Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Microgametogenesis; Pollen wall structure, MGU (male germ unit) structure, NPC system; Palynology and scope (a brief account); Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: Pseudomonads, polyads, massulae, pollinia.		Susanta Kumar Maity	
4	Unit 4: Ovule Structure; Types; Special structures–endothelium, obturator, aril, caruncle and hypostase; Female Gametophyte – megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis (details of <i>Polygonum</i> type); Organization and ultrastructure of mature embryo sac.		Susanta Kumar Maity	
5	Unit 5: Pollination and fertilization Pollination types and significance; adaptations; structure of stigma and style; path of pollen tube in pistil; double fertilization.		Susanta Kumar Maity	
6	Unit 6: Self incompatibility Basic concepts (interspecific, intraspecific, homomorphic, heteromorphic, GSI and SSD); Methods to overcome self- incompatibility: mixed pollination, bud pollination, stub pollination; Intra-ovarian and <i>in vitro</i> pollination; Modification of stigma surface, parasexual hybridization; Cybrids, <i>in vitro</i> fertilization.		Susanta Kumar Maity	
7	Unit 7: Embryo, Endosperm and Seed Structure and types; General pattern of development of dicot and monocot embryo and endosperm; Suspensor: structure and functions; Embryo-endosperm relationship; Nutrition of embryo; Unusual features; Embryo development in <i>Paeonia</i> . Seed structure, importance and dispersal mechanisms		Susanta Kumar Maity	
8	Units 7: Polyembryony and apomixis Introduction; Classification; Causes and applications.		Susanta Kumar Maity	

Semester V (AY 2019-2022)		Period: to		
Paper: CC11P (Reproductive Biology of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Anther: Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehisced anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation.	(40 lectures)	Susanta Kumar Maity	
2	2. Pollen grains: Fresh and acetolyzed showing ornamentation and aperture, psuedomonads, polyads, pollinia (slides/photographs, fresh material), ultrastructure of pollen wall(micrograph); Pollen viability: Tetrazolium test.germination: Calculation of percentage germination in different media using hanging drop method.		Susanta Kumar Maity	
3	3. Ovule: Types-anatropous, orthotropous, amphitropous/campylotropous, circinotropous, unitegmic, bitegmic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/specimens/photographs).		Susanta Kumar Maity	
4	4. Female gametophyte through permanent slides/ photographs: Types, ultrastructure of mature egg apparatus.		Susanta Kumar Maity	
5	5. Intra-ovarian pollination; Test tube pollination through photographs.		Susanta Kumar Maity	
6	6. Endosperm: Dissections of developing seeds for endosperm with free-nuclear haustoria.		Susanta Kumar Maity	
7	7. Embryogenesis: Study of development of dicot embryo through permanent slides; dissection of developing seeds for embryos at various developmental stages; Study of suspensor through electron micrographs		Susanta Kumar Maity	

Semester V (AY 2019-2022)		Period: to		
Paper: CC12T (Plant Physiology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Plant-water relations Water Potential and its components, water absorption by roots, aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap – cohesion-tension theory.Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement.	(60 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Mineral nutrition Essential and beneficial elements, macro and micronutrients, methods		Dr.Nilay Kumar	

	of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents.		Maitra	
3	Unit 3: Nutrient Uptake Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, symport, antiport.		Dr.Nilay Kumar Maitra	
4	Unit 4: Translocation in the phloem Experimental evidence in support of phloem as the site of sugar translocation. Pressure–Flow Model; Phloem loading and unloading; Source–sink relationship.		Dr.Nilay Kumar Maitra	
5	Unit 5: Plant growth regulators Discovery, chemical nature (basic structure), bioassay and physiological roles of Auxin, Gibberellins, Cytokinin, Abscisic acid, Ethylene, Brassinosteroids and Jasmonic acid.		Dr.Nilay Kumar Maitra	
6	Unit 6: Physiology of flowering Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy.		Dr.Nilay Kumar Maitra	
7	Unit 7: Phytochrome , crytochromes and phototropins Discovery, chemical nature, role in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action.		Dr.Nilay Kumar Maitra	

Semester V (AY 2019-2022)		Period: _____ to _____		
Paper: CC12P (Plant Physiology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Determination of osmotic potential of plant cell sap by plasmolytic method.	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Determination of water potential of given tissue (potato tuber) by weight method.		Dr.Nilay Kumar Maitra	
3	Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf.		Dr.Nilay Kumar Maitra	
4	Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophyte.		Dr.Nilay Kumar Maitra	
5	To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and xerophyte (both surfaces).		Dr.Nilay Kumar Maitra	
6	To study the phenomenon of seed germination (effect of light).		Dr.Nilay Kumar Maitra	
7	To study the effect of different concentrations of IAA on <i>Avena</i> coleoptile elongation (IAA Bioassay).		Dr.Nilay Kumar Maitra	
8	To study the induction of amylase activity in germinating barley grains.		Dr.Nilay Kumar Maitra	
	Demonstration experiments			

	1. To demonstrate suction due to transpiration.		Dr.Nilay Kumar Maitra	
	2. Fruit ripening/Rooting from cuttings (Demonstration).		Dr.Nilay Kumar Maitra	
	3. Bolting experiment/ <i>Avena</i> coleptile bioassay (demonstration).		Dr.Nilay Kumar Maitra	

Semester V (AY 2019-2022)		Period: to		
Paper: DSE1 (Biostatistics) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biostatistics Definition - statistical methods - basic principles. Variables - measurements, functions, limitations and uses of statistics.	(60 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Collection of data primary and secondary Types and methods of data collection procedures - merits and demerits. Classification - tabulation and presentation of data - sampling methods.		Dr.Nilay Kumar Maitra	
3	Unit 3: Measures of central tendency Mean, median, mode, geometric mean - merits & demerits. Measures of dispersion - range, standard deviation, mean deviation, quartile deviation - merits and demerits; Co-efficient of variations.		Dr.Nilay Kumar Maitra	
4	Unit 4: Correlation Types and methods of correlation, regression, simple regression equation, fitting prediction, similarities and dissimilarities of correlation and regression		Dr.Nilay Kumar Maitra	
5	Unit 5: Statistical inference Hypothesis - simple hypothesis - student 't' test - chi square test.		Dr.Nilay Kumar Maitra	

Semester V (AY 2019-2022)		Period: to		
Paper: DSE 1P (Biostatistics) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Calculation of mean, standard deviation and standard error	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Calculation of correlation coefficient values and finding out the probability		Dr.Nilay Kumar Maitra	
3	Calculation of 'F' value and finding out the probability value for the F value.		Dr.Nilay Kumar Maitra	

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Semester V (AY 2019-2022)		Period: _____ to _____		
Paper: DSE2 (Plant Breeding) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Plant Breeding Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding.	(8 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Methods of crop improvement Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages and limitations.	(8 lectures)	Susanta Kumar Maity	
3	Unit 3: Quantitative inheritance Concept, mechanism, examples of inheritance of Kernel colour in wheat, Skin colour in human beings. Monogenic vs polygenic Inheritance.	(8 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Inbreeding depression and heterosis History, genetic basis of inbreeding depression and heterosis; Applications.	(8 lectures)	Susanta Kumar Maity	
5	Unit 5: Crop improvement and breeding Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.	(8 lectures)	SkMd Ismail Al Amin	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester VI (AY 2019-2022)	Period: _____ to _____
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Paper: CC13T (Plant Metabolism) (Theory)		Full Marks:	Credit:	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Concept of metabolism Introduction, anabolic and catabolic pathways, regulation of metabolism, role of regulatory enzymes (allosteric ,covalent modulation and Isozymes).</p> <p>Unit 2: Carbon assimilation Historical background, photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, CO₂ reduction, photorespiration, C₄ pathways; Crassulacean acid metabolism; Factors affecting CO₂ reduction.</p> <p>Unit 3: Carbohydrate metabolism Synthesis and catabolism of sucrose and starch.</p> <p>Unit 4: Carbon Oxidation Glycolysis, fate of pyruvate, regulation of glycolysis, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, regulation of PDH, NADH shuttle; TCA cycle,amphibolic role, anaplerotic reactions, regulation of the cycle, mitochondrial electron transport, oxidative phosphorylation, cyanide-resistant respiration, factors affecting respiration.</p> <p>Unit 5: ATP-Synthesis Mechanism of ATP synthesis, substrate level phosphorylation, chemiosmotic mechanism (oxidative and photophosphorylation), ATP synthase, Boyers conformational model, Racker's experiment, Jagendorf's experiment; role of uncouplers.</p> <p>Unit 6: Lipid metabolism Synthesis and breakdown of triglycerides, β-oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilisation of lipids during seed germination, α oxidation</p> <p>Unit 7: Nitrogen metabolism Nitrate assimilation, biological nitrogen fixation (examples of legumes and non-legumes); Physiology and biochemistry of nitrogen fixation; Ammonia assimilation and transamination.</p> <p>Unit 8: Mechanisms of signal transduction Receptor-ligand interactions; Second messenger concept, Calcium calmodulin, MAP kinase cascade</p>	(60 lectures)	Dr.Nilay Kumar Maitra	

Semester VI (AY 2019-2022)	Period:	to
Paper: CC13P Plant Metabolism (Practical)	Full Marks:	Credit:

Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Chemical separation of photosynthetic pigments. 2. Experimental demonstration of Hill's reaction. 3. To study the effect of light intensity on the rate of photosynthesis. 4. Effect of carbon dioxide on the rate of photosynthesis. 5. To compare the rate of respiration in different parts of a plant. 6. To demonstrate activity of Nitrate reductase in germinating leaves of different plant sources. 7. To study the activity of lipases in germinating oilseeds and demonstrate mobilization of lipids 1. during germination. 8. Demonstration of fluorescence by isolated chlorophyll pigments. 9. Demonstration of absorption spectrum of photosynthetic pigments	(35 lectures)	Dr.Nilay Kumar Maitra	

Semester VI (AY 2019-2022)		Period: to		
Paper: CC14T (Plant Biotechnology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit -1: Plant Tissue Culture Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation). Unit- 2: Recombinant DNA technology Restriction Endonucleases (History, Types I-IV, biological role and application); Unit - 5: Applications of Biotechnology Pest resistant (Bt-cotton); herbicide resistant plants (RoundUp Ready soybean); Transgenic crops with improved quality traits (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines; Industrial enzymes (Aspergillase, Protease, Lipase); Genetically Engineered Products–Human Growth Hormone;	(30 lectures)	Susanta Kumar Maity	

	Humulin; Biosafety concerns.			
2	<p>Unit- 2: Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC).</p> <p>Unit- 3: Gene Cloning Recombinant DNA, Bacterial Transformation and selection of recombinant clones, PCR mediated gene cloning; Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; PCR</p> <p>Unit- 4: Methods of gene transfer Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).</p>	(30 lectures)	SkMd Ismail Al Amin	

Semester V (AY 2019-2022)		Period: to		
Paper: CC14P () (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. (a) Preparation of MS medium. (b) Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc.</p> <p>2. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs.</p> <p>3. Isolation of protoplasts.</p>	(16 lectures)	Susanta Kumar Maity	
2	<p>4. Construction of restriction map of circular and linear DNA from the data provided.</p> <p>5. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene</p> <p>6. transfer by electroporation, microinjection, microprojectile bombardment.</p> <p>7. Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs.</p> <p>8. Isolation of plasmid DNA.</p> <p>9. Restriction digestion and gel electrophoresis of plasmid DNA.</p>	(16 lectures)	SkMd Ismail Al Amin	

Semester VI (AY 2019-2022)		Period: to		
Paper: DSE3 (Industrial and Environmental Microbiology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark

1	<p>Unit 1: Scope of microbes in industry and environment</p> <p>Unit 2: Bioreactors/Fermenters and fermentation processes Solid-state and liquid-state (stationary and submerged) fermentations; Batch and continuous fermentations. Components of a typical bioreactor, Types of bioreactors laboratory, pilotscale and production fermenters; Constantly stirred tank fermenter, tower fermenter, fixed bed and fluidized bed bioreactors and air-lift fermenter. A visit to any educational institute/ industry to see an industrial fermenter, and other downstream processing operations.</p> <p>Unit 3: Microbial production of industrial products Microorganisms involved, media, fermentation conditions, downstream processing and uses; Filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilization, spray drying; Hands on microbial fermentations for the production and estimation (qualitative and quantitative) of Enzyme: amylase or lipase activity, Organic acid (citric acid or glutamic acid), alcohol (Ethanol) and antibiotic (Penicillin)</p> <p>Unit 4: Microbial enzymes of industrial interest and enzyme immobilization Microorganisms for industrial applications and hands on screening microorganisms for casein hydrolysis; starch hydrolysis; cellulose hydrolysis. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase).</p> <p>Unit 5: Microbes and quality of environment. Distribution of microbes in air; Isolation of microorganisms from soil, air and water.</p> <p>Unit 6: Microbial flora of water. Water pollution, role of microbes in sewage and domestic waste water treatment systems. Determination of BOD, COD, TDS and TOC of water samples; Microorganisms as indicators of water quality, check coliform and fecal coliform in water samples.</p> <p>Unit 7: Microbes in agriculture and remediation of contaminated soils. Biological fixation; Mycorrhizae; Bioremediation of contaminated soils. Isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.</p>	(50 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	
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Semester VI (AY 2019-2022)		Period: to		
Paper: DSE3 (Industrial and Environmental Microbiology) (Practical)		Full Marks: Credit:		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Principles and functioning of instruments in microbiology laboratory</p> <p>2. Hands on sterilization techniques and preparation of culture media.</p>	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2019-2022)		Period: to		
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Paper: DSE4 (Analytical Techniques in Plant Sciences) (Theory)		Full Marks:	Credit:	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit- 1: Imaging and related techniques Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.</p> <p>Unit- 2: Cell fractionation Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl₂ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.</p> <p>Unit- 3: Radioisotopes Use in biological research, autoradiography, pulse chase experiment.</p> <p>Unit- 4: Spectrophotometry Principle and its application in biological research.</p> <p>Unit- 5: Chromatography Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.</p> <p>Unit- 6: Characterization of proteins and nucleic acids Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE</p> <p>Unit- 7: Biostatistics Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.</p>	(50 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2019-2022)		Period:	to	
Paper: DSE4 (Analytical Techniques in Plant Sciences) (Practical)		Full Marks:	Credit:	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.</p> <p>2. Demonstration of ELISA.</p>	(30 lectures)	SkMd Ismail Al Amin	

	<p>3. To separate nitrogenous bases by paper chromatography.</p> <p>4. To separate sugars by thin layer chromatography.</p> <p>5. Isolation of chloroplasts by differential centrifugation.</p> <p>6. To separate chloroplast pigments by column chromatography.</p> <p>7. To estimate protein concentration through Lowry's methods. 8. To separate proteins using PAGE.</p> <p>9. To separation DNA (marker) using AGE.</p> <p>10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).</p> <p>11. Preparation of permanent slides (double staining)</p>		<p>&</p> <p>Susanta Kumar Maity</p>	
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**Curriculum Plan (ODD SEMESTER)
(Botany Honours; CBCS)**

Semester I (AY 2018-2021)		Period: to		
Paper: CC 1T(Phycology and Microbiology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to microbial world : Microbial nutrition, growth and metabolism. Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics, as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).	(7 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Viruses Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV).	(7 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Bacteria Discovery, general characteristics; Types-archaebacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction).	(7 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Algae General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction; Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups) and Van – den Hoek et.al(1982); Significant contributions of important phycologists (F.E. Fritsch, G.M. Smith, R.N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P. Iyengar). Role of algae in the environment, agriculture, biotechnology and industry.	(11 lectures)	Susanta Kumar Maity	
5	Unit 5: Cyanophyta and Xanthophyta Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of Nostoc and Vaucheria.	(8 lectures)	Susanta Kumar Maity	
6	Unit 6: Chlorophyta and Charophyta General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Chlamydomonas</i> , <i>Volvox</i> , <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> . Evolutionary significance of <i>Prochloron</i> .	(8 lectures)	Susanta Kumar Maity	
7	Unit 7: Phaeophyta and Rhodophyta: Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> .	(12 lectures)	Susanta Kumar Maity	

Semester I (AY 2018-2021)		Period: to		
Paper: CC 1P (Phycology and Microbiology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark

1	Microbiology 1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle. 2. Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule. 3. Gram staining. 4. Endospore staining with malachite green using the (endospores taken from soil bacteria). 5. Study of bacteria from root nodules/Curd sample.	20	SkMd Ismail Al Amin	
2	Phycology Study of vegetative and reproductive structures of Nostoc, <i>Chlamydomonas</i> (electron micrographs), Volvox, <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> , <i>Prochloron</i> through electron micrographs, temporary preparations and permanent slides.	20	Susanta Kumar Maity	

Semester I (AY 2018-2021)		Period: to		
Paper: CC 2T (Biomolecules and Cell Biology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biomolecules: Types and significance of chemical bonds; Structure and properties of water; pH and buffers. Carbohydrates: Nomenclature and classification; Monosaccharides ; Disaccharides; Oligosaccharides and polysaccharides. Lipids: Definition and major classes of storage and structural lipids; Fatty acids structure and functions; Essential fatty acids; Triacylglycerols structure, functions and properties; Phosphoglycerides. Proteins: Structure of amino acids; Levels of protein structure-primary, secondary, tertiary and quaternary; Protein denaturation and biological roles of proteins. Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA; Structure of tRNA.	(20 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Bioenergetics : Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP: structure, its role as a energy currency molecule.	(4 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Enzymes: Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; Classification of enzymes; Features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation, enzyme inhibition and factors affecting enzyme activity.	(6 lectures)	Dr. Nilay Kumar Maitra	
4	Unit4: The cell: Cell as a unit of structure and function;	(4	Dr. Nilay	

	Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory).	lectures)	Kumar Maitra	
5	Unit 5: Cell wall and plasma membrane: Chemistry, structure and function of Plant cell wall. Overview of membrane function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis.	(4 lectures)	Dr. Nilay Kumar Maitra	
6	Unit 6: Cell organelles: Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament. Chloroplast, mitochondria and peroxisomes: Structural organization; Function; Semiautonomous nature of mitochondria and chloroplast. Endomembrane system: Endoplasmic Reticulum – Structure, targeting and insertion of proteins in the ER, protein folding, processing; Smooth ER and lipid synthesis, export of proteins and lipids; Golgi Apparatus – organization, protein glycosylation, protein sorting and export from Golgi Apparatus; Lysosomes	(16 lectures)	Dr. Nilay Kumar Maitra	
7	Unit 7: Cell division: Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinases.	(6 lectures)	Dr. Nilay Kumar Maitra	

Semester I (AY 2018-2021)		Period: _____ to _____		
Paper: CC 2P (: Biomolecules and Cell Biology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins.	(30 lectures)	Dr. Nilay Kumar Maitra	
2	2. Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo /Crinum.		Dr. Nilay Kumar Maitra	
3	3. Demonstration of the phenomenon of protoplasmic streaming in Hydrilla leaf.		Dr. Nilay Kumar Maitra	
4	4. Measurement of cell size by the technique of micrometry.		Dr. Nilay Kumar Maitra	
5	5. Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains).		Dr. Nilay Kumar Maitra	
6	6. Study of cell and its organelles with the help of electron micrographs.		Dr. Nilay Kumar Maitra	

7	7. Cytochemical staining of : DNA- Feulgen Actocarmin and AcetoOrcrin stain and cell wall in the epidermal peel of onion using Periodic Schiff's (PAS) staining technique.		Dr. Nilay Kumar Maitra	
8	8. Study the phenomenon of plasmolysis and deplasmolysis.		Dr. NilayKumar Maitra	
9	9. Study the effect of organic solvent and temperature on membrane permeability.		Dr. Nilay Kumar Maitra	
10	10. Study different stages of mitosis and meiosis.		Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester II (AY 2018-2021)		Period: _____ to _____		
Paper: CC 3T (Mycology and Phytopathology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to true fungi: General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification.	(6 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Chytridiomycota and Zygomycota: Characteristic features; Ecology and significance; Thallus organisation; Reproduction; Life cycle with reference to Synchytrium, Rhizopus .	(5 lecture)	Dr. Nilay Kumar Maitra	
3	Unit 3: Ascomycota: General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; Life cycle and classification with reference to Saccharomyces, Aspergillus, Penicillium, Alternaria, Neurospora and Peziza.	(10 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Basidiomycota :General characteristics; Ecology; Life cycle and Classification with reference to black stem rust on wheat Puccinia (Physiological Specialization), loose and covered smut (symptoms only), Agaricus; Bioluminescence, Fairy Rings and Mushroom Cultivation with special reference to Oyster Mashroom.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Allied Fungi: General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.	(3 lectures)	Dr. Nilay Kumar Maitra	
6	Unit 6: Oomycota: General characteristics; Ecology; Life cycle and classification with reference to Phytophthora, Albugo.	(4 lectures)	Dr. Nilay Kumar Maitra	
7	Unit 7: Symbiotic associations Lichen: – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction; Mycorrhiza-Ectomycorrhiza, Endomycorrhiza	(4 lectures)	Dr. Nilay Kumar Maitra	

	and their significance.			
8	Unit 8: Applied Mycology: Role of fungi in biotechnology; Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology.	(10 Lectures)	Dr. Nilay Kumar Maitra	
9	Unit 9: Phytopathology: Terms and concepts; General symptoms; Geographical distribution of diseases; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine.	(10 lectures)	Dr. Nilay Kumar Maitra	
10	Bacterial diseases :- Citrus canker and angular leaf spot of cotton. Viral diseases – Tobacco Mosaic viruses, vein clearing. Fungal diseases – Early blight of potato, Black stem rust of wheat, White rust of crucifers.	(10 lectures)	SkMdIsmail Al Amin	

Semester II (AY 2018-2021)		Period: to		
Paper: CC 3P(Mycology and Phytopathology)(Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Introduction to the world of fungi (Unicellular, coenocytic/septate mycelium, ascocarps&basidiocarps).	(30 lectures)	Dr. Nilay Kumar Maitra	
2	2. Rhizopus: study of asexual stage from temporary mounts and sexual structures through permanent slides.		Dr. Nilay Kumar Maitra	
3	3. Aspergillus and Penicillium: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.		Dr. Nilay Kumar Maitra	
4	4. Peziza: Ascobulus sectioning through ascocarp.		Dr. Nilay Kumar Maitra	
5	5. Alternaria: Specimens/photographs and temporary mounts.		Dr. Nilay Kumar Maitra	
6	6. Puccinia: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts.		Dr. Nilay Kumar Maitra	
7	7. Agaricus: Specimens of button stage and full grown mushroom; sectioning of gills of Agaricus, fairy rings and bioluminescent mushrooms to be shown.		Dr. Nilay Kumar Maitra	
8	8. Study of phaneroplasmodium from actual specimens and /or photograph. Study of Stemonitis sporangia.		Dr. Nilay Kumar Maitra	

9	9. Albugo: Study of symptoms of plants infected with Albugo; asexual phase study through section/ temporary mounts and sexual structures through permanent slides.		Dr. Nilay Kumar Maitra	
10	10. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs)		Dr. Nilay Kumar Maitra	
11	11. Phytopathology : Herbarium specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifers.	(10 lectures)	SkMd Ismail Al Amin	

Semester II (AY 2018-2021)		Period: _____ to _____		
Paper: CC 4T (Archegoniate) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction: Unifying features of archegoniate; Transition to land habit; Alternation of generations.	(4 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Bryophytes: General characteristics; Adaptations to land habit; Classification; Range of thallus organization.	(6 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Type Studies:- Bryophytes Classification (up to family), morphology, anatomy and reproduction of Riccia, Marchantia, Pellia, Porella, Anthoceros, Sphagnum and Funaria; Pogonatum, Reproduction and evolutionary trends in Riccia, Marchantia, Plagichasma Anthoceros and Funaria (developmental stages not included). Ecological and economic importance of bryophytes with special reference to Sphagnum.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Pteridophytes: General characteristics; Classification; Early land plants (Cooksonia and Rhynia).	(6 lectures)	Susanta Kumar Maity	
5	Unit 5: Type Studies:- Pteridophytes Classification (up to family), morphology, anatomy and reproduction of Psilotum, Selaginella, Equisetum and Pteris (Developmental details not to be included). Apogamy, and apospory, heterospory and seed habit, telome theory, stelar evolution; Ecological and economic importance.	(14 lectures)	Susanta Kumar Maity	
6	Unit 6: Gymnosperms: General characteristics, classification (up to family), morphology, anatomy and reproduction of Cycas, Pinus and Gnetum (Developmental details not to be included); Ecological and economic importance.	(18 lectures)	Susanta Kumar Maity	

Semester II (AY 2018-2021)		Period: _____ to _____		
Paper: CC 4P (Archegoniate) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Riccia – Morphology of thallus.	(15 lectures)		
2	2. Marchantia- Morphology of thallus, whole mount of rhizoids & Scales, vertical section of thallus through Gemma cup, whole mount of Gemmae (all temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte (all permanent slides).		SkMd Ismail Al Amin	
3	3. Anthoceros- Morphology of thallus, dissection of sporophyte (to show stomata, spores, pseudoelaters, columella) (temporary slide), vertical section of thallus (permanent slide).		SkMd Ismail Al Amin	
4	4. Pellia, Porella- Permanent slides.		SkMd Ismail Al Amin	
5	5. Sphagnum- Morphology of plant, whole mounts of leaf (permanent slide only).		SkMd Ismail Al Amin	
6	6. Funaria- Pogonatum/ Polytrichum Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, longitudinal section of capsule and protonema.		SkMd Ismail Al Amin	
7	7. Psilotum- Study of specimen, transverse section of synangium (permanent slide).	(15 lectures)	Susanta Kumar Maity	
8	8. Selaginella- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide).		Susanta Kumar Maity	
9	9. Equisetum- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (wet and dry) (temporary slide), transverse section of rhizome (permanent slide).		Susanta Kumar Maity	
10	10. Pteris- Morphology, transverse section of rachis, vertical section of sporophyll, whole mount of sporangium, whole mount of spores (temporary slides), transverse section of rhizome, whole mount of prothallus with sex organs and young sporophyte (permanent slide).		Susanta Kumar Maity	
11	11. Cycas- Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide).		Susanta Kumar Maity	
12	12. Pinus- Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), transverse section of Needle, transverse section of stem, longitudinal section of / transverse section of male cone, whole mount of microsporophyll, whole mount of Microspores (temporary slides), longitudinal section of female cone, tangential longitudinal section & radial longitudinal sections stem (permanent slide).		Susanta Kumar Maity	
13	13. Gnetum- Morphology (stem, male & female cones), transverse section of stem, vertical section of ovule (permanent slide)		Susanta Kumar Maity	

14	14. Botanical excursion		Susanta Kumar Maity	
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**Curriculum Plan (ODD SEMESTER)
(Botany Honours; CBCS)**

Semester III (AY 2018-2021)		Period: _____ to _____		
Paper: CC5T (Anatomy of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction and scope of Plant Anatomy: Applications in systematics, forensics and pharmacognosy.	(4 Lectures)	Susanta Kumar Maity	
2	Unit 2: Structure and Development of Plant Body Internal organization of plant body: The three tissue systems, types of cells and tissues. Development of plant body: polarity, cytodifferentiation and organogenesis during embryogenic development, Root-stem transition, Nodal anatomy – Basic concept.	(6 Lectures)	Susanta Kumar Maity	
3	Unit 3: Tissues Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation of tracheary elements and sieve elements; Pits and plasmodesmata; Wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts and laticifers.	(12 Lectures)	Susanta Kumar Maity	
4	Unit 4: Apical meristems: Evolution of concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory, continuing meristematic residue, cytohistological zonation); Types of vascular bundles; Structure of dicot and monocot stem. Origin, development, arrangement and diversity in size and shape of leaves; Structure of dicot and monocot leaf, Kranz anatomy. Organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe theory); Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin of lateral root.	(15 Lectures)	Susanta Kumar Maity	
5	Unit 5: Vascular Cambium and Wood Structure, function and seasonal activity of cambium; Secondary growth in root and stem. Anomalous secondary growth in Bignonia, Boerhaavia, Aristolochia and Dracaena. Axially and radially oriented elements; Types of rays and axial parenchyma; Cyclic aspects and reaction wood; Sapwood and heartwood; Ring and diffuse porous wood; Early and late wood, tyloses; Dendrochronology. Development and composition of periderm, rhytidome and lenticels.	(15 Lectures)	Susanta Kumar Maity	
6	Unit 6: Adaptive and Protective Systems Epidermal tissue system, cuticle, epicuticular waxes, trichomes(uni-and multicellular, glandular and nonglandular, two examples of each), stomata (classification); Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes. Mechanical tissue – distribution and significance.	(8 Lectures)	Susanta Kumar Maity	

Semester III (AY 2018-2021)		Period: to		
Paper: CC5P (Anatomy of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSE S ALLOTE D	Class taken by	Remark
1	<p>1. Study of anatomical details through permanent slides/temporary stain mounts/ macerations/museum specimens with the help of suitable examples.</p> <p>2. Apical meristem of root, shoot and vascular cambium</p> <p>3. Distribution and types of parenchyma, collenchyma and sclerenchyma.</p> <p>4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates; xylem fibres.</p> <p>5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood.</p> <p>6. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres.</p> <p>7. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular</p> <p>8. Root: monocot, dicot, secondary growth.</p> <p>9. Stem: monocot, dicot - primary and secondary growth; periderm; lenticels.</p> <p>10. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy).</p> <p>11. Adaptive Anatomy: xerophytes, hydrophytes.</p> <p>12. Secretory tissues: cavities, lithocysts and laticifers.</p>	(20 Lectur es)	Susanta Kumar Maity	

Semester III (AY 2018-2021)		Period: _____ to _____		
Paper: CC6T (Economic Botany) (Theory)		Full Marks: 40		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Origin of Cultivated Plants: Concept of Centres of Origin, their importance with reference to Vavilov's work. Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity.</p> <p>Unit 2: Cereals: Wheat and Rice (origin, morphology, cultivation, management processing & uses); Brief account of millets.</p> <p>Unit 3: Legumes: Origin, morphology cultivation, management and uses of Chick pea, Pigeon pea and fodder legumes. Importance to man and ecosystem.</p> <p>Unit 4: Sources of sugars and starches: (Morphology cultivation, management and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, propagation & uses.</p> <p>Unit 5: Spices: Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper</p> <p>Unit 6: Beverages: Tea, Coffee (morphology, processing & uses)</p> <p>Unit 7: Sources of oils and fats :General description, classification, extraction, their uses and health implications groundnut, coconut, linseed, soybean, mustard and coconut (Botanical name, family & uses). Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.</p> <p>Unit 8: Natural Rubber: Para-rubber: tapping, processing and uses.</p> <p>Unit 9: Drug-yielding plants :Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Tobacco (Morphology, processing, uses and health hazards).</p> <p>Unit 10: Timber plants: General account with special reference to teak and pine.</p> <p>Unit 11: Fibers: Classification based on the origin of fibers; Cotton, Coir and Jute (morphology, extraction and uses).</p>	(60 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2018-2021)		Period: _____ to _____		
Paper: CC6P (Economic Botany) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Cereals: Wheat (habit sketch, L. S/T.S. grain, starch grains, micro-chemical tests) Rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests).</p> <p>2. Legumes: Soybean, Groundnut, (habit, fruit, seed structure, micro-chemical tests).</p> <p>3. Sources of sugars and starches: Sugarcane (habit sketch; cane juice-micro-chemical tests), Potato (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests).</p> <p>4. Spices: Black pepper, Fennel and Clove (habit and sections).</p> <p>5. Beverages: Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).</p> <p>6. Sources of oils and fats: Coconut- T.S. nut, Mustard-plant specimen, seeds; tests for fats in crushed seeds.</p> <p>7. Essential oil-yielding plants: Habit sketch of Rosa, Vetiveria, Santalum and Eucalyptus (specimens/photographs).</p> <p>8. Rubber: specimen, photograph/model of tapping, samples of rubber products.</p> <p>9. Drug-yielding plants: Specimens of Digitalis, Papaver and Cannabis.</p> <p>10. Tobacco: specimen and products of Tobacco.</p> <p>11. Woods: Tectona, Pinus: Specimen, Section of young stem.</p> <p>12. Fiber-yielding plants: Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).</p>	(24 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2018-2021)		Period: _____ to _____		
Paper: CC7T (Genetics) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Mendelian genetics and its extension Mendelism: History; Principles of inheritance; Chromosome theory of inheritance; Autosomes and sex chromosomes; Probability and pedigree analysis; Incomplete dominance and codominance; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Recessive and Dominant traits, Penetrance and Expressivity, Numericals; Polygenic inheritance.	(16 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Extrachromosomal Inheritance Chloroplast mutation: Variegation in Four o'clock plant; Mitochondrial mutations in yeast; Maternal effects-shell coiling in snail; Infective heredity- Kappa particles in Paramecium.	(6 lectures)	SkMd Ismail Al Amin	

3	Unit 3: Linkage, crossing over and chromosome mapping Linkage and crossing over-Cytological and molecular basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence; Numericals based on gene mapping; Sex Linkage.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Variation in chromosome number and structure Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy	(8 lectures)	SkMd Ismail Al Amin	
5	Unit 5: Gene mutations Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method. Role of Transposons in mutation.DNA repair mechanisms.	(6 lectures)	SkMd Ismail Al Amin	
6	Unit 6: Fine structure of gene Classical vs molecular concepts of gene; Cis-Trans complementation test for functional allelism; Structure of Phage T4, rII Locus.	(6 lectures)	SkMd Ismail Al Amin	
7	Unit 6. Population and Evolutionary Genetics Allele frequencies, Genotype frequencies, Hardy-Weinberg Law, role of natural selection, mutation, genetic drift. Genetic variation and Speciation.	(6 lectures)	SkMd Ismail Al Amin	

Semester III (AY 2018-2021)		Period: _____ to _____		
Paper: CC7P (Genetics) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Demonstration on pretreatment, fixation, staining and squash and smear preparation.	(40 lectures)	SkMd Ismail Al Amin	
2	2. Study of Mitosis from Onion / Garlic / Lentil root.		SkMd Ismail Al Amin	
3	3. Study of Meiosis with pollen mother cell (PMC) of Onion / Solanum / Datura by smear preparation.		SkMd Ismail Al Amin	
4	4. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.		SkMd Ismail Al Amin	
5	5. Chromosome mapping using point test cross data.		SkMd Ismail Al Amin	
6	6. Pedigree analysis for dominant and recessive autosomal and sex linked traits		SkMd Ismail Al Amin	
7	7. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).		SkMd Ismail Al Amin	
8	8. Blood Typing: groups & Rh factor.		SkMd Ismail Al Amin	

9	9. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.		SkMd Ismail Al Amin	
10	10. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.		SkMd Ismail Al Amin	
11	11. Study of human genetic traits: Sickle cell anemia, Xeroderma Pigmentosum, Albinism, red-green Colour blindness, Widow's peak, Rolling of tongue, Hitchhiker's thumb and Attached ear lobe		SkMd Ismail Al Amin	

Semester III (AY 2018-2021)		Period: to		
Paper: SEC1T (Biofertilizers) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.	(4 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.	(8 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.	(4 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.	(6 lectures)	Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester IV (AY 2018-2021)		Period: to		
Paper: CC8T (Molecular Biology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit- 1: Nucleic acids: Carriers of genetic information Historical perspective; DNA as the carrier of genetic information (Griffith's, Hershey	(60	SkMd Ismail	

	& Chase, Avery, McLeod & McCarty, Fraenkel-Conrat's experiment.	lectures)	Al Amin	
2	Unit -2. The Structures of DNA and RNA / Genetic Material DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves; Organization of DNA-Prokaryotes, Viruses, Eukaryotes. RNA Structure- Organelle DNA -- mitochondria and chloroplast DNA. The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin.			
3	Unit- 2: The replication of DNA Chemistry of DNA synthesis (Kornberg's discovery); General principles – bidirectional, semiconservative and semi discontinuous replication, RNA priming; Various models of DNA replication, including rolling circle, θ (theta) mode of replication, replication of linear ds-DNA, replication of the 5' end of linear chromosome; Enzymes involved in DNA replication.			
4	Unit- 3: Central dogma and genetic code Key experiments establishing- The Central Dogma (Adaptor hypothesis and discovery of mRNA template), Genetic code (deciphering & salient features)			
5	Unit 4: Transcription Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation; Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in E.coli. Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormones; Gene silencing.	(60 lectures)	Susanta Kumar Maity	
6	Unit 5: Processing and modification of RNA Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing (5' cap, 3' polyA tail); Ribozymes; RNA editing and mRNA transport.			
7	Unit 6: Translation Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins.			

Semester IV (AY 2018-2021)		Period: _____ to _____		
Paper: CC8P (Molecular Biology) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Preparation of LB medium and raising E.Coli.	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	
	2. Isolation of genomic DNA from <i>E. Coli</i> .			
	3. DNA isolation from cauliflower head.			
	4. DNA estimation by diphenylamine reagent/UV Spectrophotometry.			
	5. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).			
	6. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs			
	7. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)			
	8. Study of the following through photographs: Assembly of Spliceosome			

	machinery; Splicing mechanism in group I & group II introns; Ribozyme and Alternative splicing.			
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Semester IV (AY 2018-2021)		Period: to		
Paper: CC9T (Plant Ecology and Phytogeography) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Basic concepts; Levels of organization. Inter-relationships between the living world and the environment, the components and dynamism, homeostasis.	(60 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Soil Importance; Origin; Formation; Composition; Physical; Chemical and Biological components; Soil profile; Role of climate in soil development.		Dr. Nilay Kumar Maitra	
3	Unit 3: Water Importance: States of water in the environment; Atmospheric moisture; Precipitation types (rain, fog, snow, hail, dew); Hydrological Cycle; Water in soil; Water table.		Dr. Nilay Kumar Maitra	
4	Unit 4: Light, temperature, wind and fire Variations; adaptations of plants to their variation.		Dr. Nilay Kumar Maitra	
5	Unit 5: Ecosystems Structure; Processes; Trophic organisation; Food chains and Food webs; Ecological pyramids.		Dr. Nilay Kumar Maitra	
6	Unit 6: Population ecology Characteristics and Dynamics .Ecological Speciation		Dr. Nilay Kumar Maitra	
7	Unit 7: Plant communities Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts.		Dr. Nilay Kumar Maitra	
8	Unit 8: Biotic interactions Trophic organization, basic source of energy, autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop.		Dr. Nilay Kumar Maitra	
9	Unit 9: Functional aspects of ecosystem Principles and models of energy flow; Production and productivity; Ecological efficiencies; Biogeochemical cycles; Cycling of Carbon,		Dr. Nilay Kumar Maitra	

	Nitrogen and Phosphorus.			
10	Unit 10: Phytogeography Principles; Continental drift; Theory of tolerance; Endemism; Brief description of major terrestrial biomes (one each from tropical, temperate & tundra); Phytogeographical division of India; Local Vegetation.		Dr. Nilay Kumar Maitra	

Semester IV (AY 2018-2021)		Period: to		
Paper: CC9P (Plant Ecology and Phytogeography) (Practical)		Full Marks: Credit:		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	(36 lectures)	Dr. Nilay Kumar Maitra	
2	2. Determination of pH of various soil and water samples (pH meter, universal indicator/Lovibond comparator and pH paper)		Dr. Nilay Kumar Maitra	
3	3. Analysis for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency from		Dr. Nilay Kumar Maitra	
4	4. two soil samples by rapid field tests.		Dr. Nilay Kumar Maitra	
5	5. Determination of organic matter of different soil samples by Walkley& Black rapid titration		Dr. Nilay Kumar Maitra	
6	6. method		Dr. Nilay Kumar Maitra	
7	7. Comparison of bulk density, porosity and rate of infiltration of water in soils of three habitats.		Dr. Nilay Kumar Maitra	
8	8. Determination of dissolved oxygen of water samples from polluted and unpolluted sources.		Dr. Nilay Kumar Maitra	
9	9. (a). Study of morphological adaptations of hydrophytes and xerophytes (four each). (b). Study of biotic interactions of the following: Stem parasite (Cuscuta), Root parasite (Orobanchae) Epiphytes, Predation (Insectivorous plants).		Dr. Nilay Kumar Maitra	
10	10. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus, by species area curve method (species to be listed).		Dr. Nilay Kumar Maitra	
11	11. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law.		Dr. Nilay Kumar Maitra	

12	12. Quantitative analysis of herbaceous vegetation for density and abundance in the college campus. 13. Field visit to familiarise students with ecology of different sites.		Dr. Nilay Kumar Maitra	
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Semester IV (AY 2018-2021)		Period: to		
Paper: CC10T (Plant Systematics) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Significance of Plant systematics Introduction to systematics; Plant identification, Classification, Nomenclature. Evidences from palynology, cytology, phytochemistry and molecular data. Field inventory; Functions of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals; Keys: Single access and Multi-access.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Taxonomic hierarchy Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary).		Susanta Kumar Maity	
3	Unit 3: Botanical nomenclature Principles and rules (ICN); Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids.		Susanta Kumar Maity	
4	Unit 4: Systems of classification Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series); Brief reference of Angiosperm Phylogeny Group (APG III) classification.		Susanta Kumar Maity	
5	Unit 5: Biometrics, numerical taxonomy and cladistics Characters; Variations; OTUs, character weighting and coding; Cluster analysis; Phenograms, cladograms (definitions and differences).		Susanta Kumar Maity	
6	Unit 6: Phylogeny of Angiosperms Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating evolutionary relationship (phylogenetic tree, cladogram).		Susanta Kumar Maity	

Semester IV (AY 2018-2021)		Period: to		
Paper: CC10P (Plant Systematics) (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of vegetative and floral characters of the following	(36)	Susanta Kumar	

	<p>families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):</p> <ol style="list-style-type: none"> 1. Ranunculaceae - Ranunculus, Delphinium. 2. Brassicaceae - Brassica, Alyssum / Iberis. 3. Malvaceae – Sida Sp. Urenalobota. 4. Myrtaceae - Eucalyptus, Callistemon 5. Umbelliferae - Coriandrum /Anethum / Foeniculum. 6. Asteraceae - Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax. 7. Solanaceae - Solanum nigrum/Withania, Nicotina, Plumbaginefolia. 8. Lamiaceae - Salvia/Ocimum. 9. Euphorbiaceae - Euphorbia hirta/E.milii, Jatropha. 10. Fasaceae – TephrosiaSp.,Crotalaria Sp., 11. Caesalpineaeceae – Cassia Sp., 12. Asclepiadaeceae- PesgulariaGygnema, 13. Apocynaceae – Hollorhen, Catharanthus. 14. Rubiaceae – Oldenladeae, Spermoeoceae, 15. Liliaceae - Asphodelus/Lilium/Allium. 16. Poaceae - Triticum/Hordeum/Avena. 	lectures)	Maity	
2	2. Field visit (local) – Subject to grant of funds from the university.		Susanta Kumar Maity	
3	3. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).		Susanta Kumar Maity	

Semester IV (AY 2018-2021)		Period: _____ to _____		
Paper: SEC2T (Mushroom Culture Technology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms.Types of edible mushrooms available in India - <i>Volvariellavolvacea</i> , <i>Pleurotuscitrinopileatus</i> , <i>Agaricusbisporus</i> .	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove,		Dr.Nilay Kumar	

	sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.		Maitra	
3	Unit 3: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.		Dr.Nilay Kumar Maitra	
4	Unit 4: Food Preparation:Types of foods prepared from mushroom.Research Centres - National level and Regional level.Cost benefit ratio - Marketing in India and abroad, Export Value.		Dr.Nilay Kumar Maitra	

Curriculum Plan (Botany Honours; CBCS)

Semester V (AY 2018-2021)		Period: to		
Paper: CC11T (Reproductive Biology of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction :History (contributions of G.B. Amici, W. Hofmeister, E. Strasburger, S.G. Nawaschin, P. Maheshwari, B.M. Johri, W.A. Jensen, J. Heslop-Harrison) and scope.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Reproductive development :Induction of flowering; flower as a modified determinate shoot. Flower development: genetic and molecular aspects.		Susanta Kumar Maity	
3	Unit 3: Anther and pollen biology Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Microgametogenesis; Pollen wall structure, MGU (male germ unit) structure, NPC system; Palynology and scope (a brief account); Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: Pseudomonads, polyads, massulae, pollinia.		Susanta Kumar Maity	
4	Unit 4: Ovule Structure; Types; Special structures–endothelium, obturator, aril, caruncle and hypostase; Female Gametophyte – megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis (details of <i>Polygonum</i> type); Organization and ultrastructure of mature embryo sac.		Susanta Kumar Maity	
5	Unit 5: Pollination and fertilization Pollination types and significance; adaptations; structure of stigma and style; path of pollen tube in pistil; double fertilization.		Susanta Kumar Maity	
6	Unit 6: Self incompatibility Basic concepts (interspecific, intraspecific, homomorphic, heteromorphic, GSI and SSI); Methods to overcome self- incompatibility: mixed pollination, bud pollination, stub pollination; Intra-ovarian and <i>in vitro</i> pollination; Modification of stigma surface, parasexual hybridization; Cybrids, <i>in vitro</i> fertilization.		Susanta Kumar Maity	
7	Unit 7: Embryo, Endosperm and Seed Structure and types; General pattern of development of dicot and monocot embryo and endosperm; Suspensor: structure and functions; Embryo-endosperm relationship; Nutrition of embryo; Unusual features; Embryo development in <i>Paeonia</i> . Seed structure, importance and dispersal mechanisms		Susanta Kumar Maity	
8	Units 7: Polyembryony and apomixis Introduction; Classification; Causes and applications.		Susanta Kumar Maity	

Semester V (AY 2018-2021)		Period: to		
Paper: CC11P (Reproductive Biology of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Anther: Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehisced anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation.	(40 lectures)	Susanta Kumar Maity	
2	2. Pollen grains: Fresh and acetolyzed showing ornamentation and aperture, pseudomonads, polyads, pollinia (slides/photographs, fresh material), ultrastructure of pollen wall (micrograph); Pollen viability: Tetrazolium test. germination: Calculation of percentage germination in different media using hanging drop method.		Susanta Kumar Maity	
3	3. Ovule: Types-anatropous, orthotropous, amphitropous/campylotropous, circinotropous, unitegmic, bitegmic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/specimens/photographs).		Susanta Kumar Maity	
4	4. Female gametophyte through permanent slides/ photographs: Types, ultrastructure of mature egg apparatus.		Susanta Kumar Maity	
5	5. Intra-ovarian pollination; Test tube pollination through photographs.		Susanta Kumar Maity	
6	6. Endosperm: Dissections of developing seeds for endosperm with free-nuclear haustoria.		Susanta Kumar Maity	
7	7. Embryogenesis: Study of development of dicot embryo through permanent slides; dissection of developing seeds for embryos at various developmental stages; Study of suspensor through electron micrographs		Susanta Kumar Maity	

Semester V (AY 2018-2021)		Period: to		
Paper: CC12T (Plant Physiology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Plant-water relations Water Potential and its components, water absorption by roots, aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap – cohesion-tension theory. Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement.	(60 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Mineral nutrition Essential and beneficial elements, macro and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents.		Dr. Nilay Kumar Maitra	

3	Unit 3: Nutrient Uptake Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, symport, antiport.		Dr.Nilay Kumar Maitra	
4	Unit 4: Translocation in the phloem Experimental evidence in support of phloem as the site of sugar translocation. Pressure–Flow Model; Phloem loading and unloading; Source–sink relationship.		Dr.Nilay Kumar Maitra	
5	Unit 5: Plant growth regulators Discovery, chemical nature (basic structure), bioassay and physiological roles of Auxin, Gibberellins, Cytokinin, Abscisic acid, Ethylene, Brassinosteroids and Jasmonic acid.		Dr.Nilay Kumar Maitra	
6	Unit 6: Physiology of flowering Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy.		Dr.Nilay Kumar Maitra	
7	Unit 7: Phytochrome , crytochromes and phototropins Discovery, chemical nature, role in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action.		Dr.Nilay Kumar Maitra	

Semester V (AY 2018-2021)		Period: _____ to _____			
Paper: CC12P (Plant Physiology) (Practical)		Full Marks: 20		Credit:02	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	Determination of osmotic potential of plant cell sap by plasmolytic method.	(40 lectures)	Dr.Nilay Kumar Maitra		
2	Determination of water potential of given tissue (potato tuber) by weight method.		Dr.Nilay Kumar Maitra		
3	Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf.		Dr.Nilay Kumar Maitra		
4	Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophyte.		Dr.Nilay Kumar Maitra		
5	To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and xerophyte (both surfaces).		Dr.Nilay Kumar Maitra		
6	To study the phenomenon of seed germination (effect of light).		Dr.Nilay Kumar Maitra		
7	To study the effect of different concentrations of IAA on <i>Avenacoleoptile</i> elongation (IAA Bioassay).		Dr.Nilay Kumar Maitra		
8	To study the induction of amylase activity in germinating barley grains.		Dr.Nilay Kumar Maitra		
	Demonstration experiments				
	1. To demonstrate suction due to transpiration.		Dr.Nilay Kumar Maitra		

	2. Fruit ripening/Rooting from cuttings (Demonstration).		Dr.Nilay Kumar Maitra	
	3. Bolting experiment/ <i>Avenacoleptile</i> bioassay (demonstration).		Dr.Nilay Kumar Maitra	

Semester V (AY 2018-2021)		Period: to		
Paper: DSE1 (Biostatistics) (Theory)		Full Marks: 40 Credit:04		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biostatistics Definition - statistical methods - basic principles. Variables - measurements, functions, limitations and uses of statistics.	(60 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Collection of data primary and secondary Types and methods of data collection procedures - merits and demerits. Classification - tabulation and presentation of data - sampling methods.		Dr.Nilay Kumar Maitra	
3	Unit 3:Measures of central tendency Mean, median, mode, geometric mean - merits & demerits. Measures of dispersion - range, standard deviation, mean deviation, quartile deviation - merits and demerits; Co-efficient of variations.		Dr.Nilay Kumar Maitra	
4	Unit 4: Correlation Types and methods of correlation, regression, simple regression equation, fitting prediction, similarities and dissimilarities of correlation and regression		Dr.Nilay Kumar Maitra	
5	Unit 5: Statistical inference Hypothesis - simple hypothesis - student 't' test - chi square test.		Dr.Nilay Kumar Maitra	

Semester V (AY 2018-2021)		Period: to		
Paper: DSE 1P (Biostatistics) (Practical)		Full Marks: 20 Credit:02		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Calculation of mean, standard deviation and standard error	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Calculation of correlation coefficient values and finding out the probability		Dr.Nilay Kumar Maitra	
3	Calculation of 'F' value and finding out the probability value for the F value.		Dr.Nilay Kumar Maitra	

Semester V (AY 2018-2021)		Period: to		
Paper: DSE2 (Plant Breeding) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Plant Breeding Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding.	(8 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Methods of crop improvement Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages and limitations.	(8 lectures)	Susanta Kumar Maity	
3	Unit 3: Quantitative inheritance Concept, mechanism, examples of inheritance of Kernel colour in wheat, Skin colour in human beings. Monogenic vs polygenic Inheritance.	(8 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Inbreeding depression and heterosis History, genetic basis of inbreeding depression and heterosis; Applications.	(8 lectures)	Susanta Kumar Maity	
5	Unit 5: Crop improvement and breeding Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.	(8 lectures)	SkMd Ismail Al Amin	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester VI (AY 2018-2021)		Period: to		
Paper: CC13T (Plant Metabolism) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Concept of metabolism Introduction, anabolic and catabolic pathways, regulation of metabolism, role of regulatory enzymes (allosteric ,covalent modulation and Isozymes).	(60 lectures)	Dr.Nilay Kumar Maitra	

	<p>Unit 2: Carbon assimilation Historical background, photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, CO₂ reduction, photorespiration, C₄ pathways; Crassulacean acid metabolism; Factors affecting CO₂ reduction.</p> <p>Unit 3: Carbohydrate metabolism Synthesis and catabolism of sucrose and starch.</p> <p>Unit 4: Carbon Oxidation Glycolysis, fate of pyruvate, regulation of glycolysis, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, regulation of PDH, NADH shuttle; TCA cycle, amphibolic role, anaplerotic reactions, regulation of the cycle, mitochondrial electron transport, oxidative phosphorylation, cyanide-resistant respiration, factors affecting respiration.</p> <p>Unit 5: ATP-Synthesis Mechanism of ATP synthesis, substrate level phosphorylation, chemiosmotic mechanism (oxidative and photophosphorylation), ATP synthase, Boyers conformational model, Racker's experiment, Jagendorf's experiment; role of uncouplers.</p> <p>Unit 6: Lipid metabolism Synthesis and breakdown of triglycerides, β-oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilisation of lipids during seed germination, α oxidation</p> <p>Unit 7: Nitrogen metabolism Nitrate assimilation, biological nitrogen fixation (examples of legumes and non-legumes); Physiology and biochemistry of nitrogen fixation; Ammonia assimilation and transamination.</p> <p>Unit 8: Mechanisms of signal transduction Receptor-ligand interactions; Second messenger concept, Calcium calmodulin, MAP kinase cascade</p>			
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Semester VI (AY 2018-2021)		Period: _____ to _____		
Paper: CC13P Plant Metabolism (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Chemical separation of photosynthetic pigments.</p> <p>2. Experimental demonstration of Hill's reaction.</p> <p>3. To study the effect of light intensity on the rate of photosynthesis.</p>	(35 lectures)	Dr. Nilay Kumar Maitra	

<p>4. Effect of carbon dioxide on the rate of photosynthesis.</p> <p>5. To compare the rate of respiration in different parts of a plant.</p> <p>6. To demonstrate activity of Nitrate reductase in germinating leaves of different plant sources.</p> <p>7. To study the activity of lipases in germinating oilseeds and demonstrate mobilization of lipids 1. during germination.</p> <p>8. Demonstration of fluorescence by isolated chlorophyll pigments.</p> <p>9. Demonstration of absorption spectrum of photosynthetic pigments</p>			
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Semester VI (AY 2018-2021)		Period: _____ to _____		
Paper: CC14T (Plant Biotechnology) (Theory)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit -1: Plant Tissue Culture Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation).</p> <p>Unit- 2: Recombinant DNA technology Restriction Endonucleases (History, Types I-IV, biological role and application);</p> <p>Unit - 5: Applications of Biotechnology Pest resistant (Bt-cotton); herbicide resistant plants (RoundUp Ready soybean); Transgenic crops with improved quality traits (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines; Industrial enzymes (Aspergillase, Protease, Lipase); Genetically Engineered Products–Human Growth Hormone; Humulin; Biosafety concerns.</p>	(30 lectures)	Susanta Kumar Maity	
2	<p>Unit- 2: Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC).</p> <p>Unit- 3: Gene Cloning Recombinant DNA, Bacterial Transformation and selection of recombinant clones, PCRmediated gene cloning; Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; PCR</p> <p>Unit- 4: Methods of gene transfer Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).</p>	(30 lectures)	SkMd Ismail Al Amin	

Semester V (AY 2018-2021)		Period: _____ to _____		
Paper: CC14P (_____) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. (a) Preparation of MS medium. (b) Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc.</p> <p>2. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs.</p> <p>3. Isolation of protoplasts.</p>	(16 lectures)	Susanta Kumar Maity	
2	<p>4. Construction of restriction map of circular and linear DNA from the data provided.</p> <p>5. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene</p> <p>6. transfer by electroporation, microinjection, microprojectile bombardment.</p> <p>7. Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs.</p> <p>8. Isolation of plasmid DNA.</p> <p>9. Restriction digestion and gel electrophoresis of plasmid DNA.</p>	(16 lectures)	SkMd Ismail Al Amin	

Semester VI (AY 2018-2021)		Period: _____ to _____		
Paper: DSE3 (Industrial and Environmental Microbiology) (Theory)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Scope of microbes in industry and environment</p> <p>Unit 2: Bioreactors/Fermenters and fermentation processes Solid-state and liquid-state (stationary and submerged) fermentations; Batch and continuous fermentations. Components of a typical bioreactor, Types of bioreactors laboratory, pilotscale and production fermenters; Constantly stirred tank fermenter, tower fermenter, fixed bed and fluidized bed bioreactors and air-lift fermenter. A visit to any educational institute/ industry to see an industrial fermenter, and other downstream processing operations.</p> <p>Unit 3: Microbial production of industrial products Microorganisms involved, media, fermentation conditions, downstream processing and uses; Filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilization, spray drying; Hands on microbial fermentations for the production and estimation (qualitative and quantitative) of Enzyme: amylase or lipase activity, Organic acid (citric acid or glutamic acid), alcohol (Ethanol) and antibiotic (Penicillin)</p> <p>Unit 4: Microbial enzymes of industrial interest and enzyme immobilization</p>	(50 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

<p>Microorganisms for industrial applications_ and hands on screening microorganisms for casein hydrolysis; starch hydrolysis; cellulose hydrolysis. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase).</p> <p>Unit 5: Microbes and quality of environment. Distribution of microbes in air; Isolation of microorganisms from soil, air and water.</p> <p>Unit 6: Microbial flora of water. Water pollution, role of microbes in sewage and domestic waste water treatment systems. Determination of BOD, COD, TDS and TOC of water samples; Microorganisms as indicators of water quality, check coliform and fecal coliform in water samples.</p> <p>Unit 7: Microbes in agriculture and remediation of contaminated soils. Biological fixation; Mycorrhizae; Bioremediation of contaminated soils. Isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.</p>			
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Semester VI (AY 2018-2021)		Period: to		
Paper: DSE3 (Industrial and Environmental Microbiology) (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Principles and functioning of instruments in microbiology laboratory</p> <p>2. Hands on sterilization techniques and preparation of culture media.</p>	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2018-2021)		Period: to		
Paper: DSE4 (Analytical Techniques in Plant Sciences) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit- 1: Imaging and related techniques Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.</p> <p>Unit- 2: Cell fractionation Centrifugation: Differential and</p>	(50 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

<p>density gradient centrifugation, sucrose density gradient, CsCl₂ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.</p> <p>Unit- 3: Radioisotopes Use in biological research, autoradiography, pulse chase experiment.</p> <p>Unit- 4: Spectrophotometry Principle and its application in biological research.</p> <p>Unit- 5: Chromatography Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.</p> <p>Unit- 6: Characterization of proteins and nucleic acids Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE</p> <p>Unit- 7: Biostatistics Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.</p>			
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Semester VI (AY 2018-2021)		Period: _____ to _____		
Paper: DSE4 (Analytical Techniques in Plant Sciences) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Study of Blotting techniques: Southern, Northern and Western, DNA fingerprinting, DNA sequencing, PCR through photographs.</p> <p>2. Demonstration of ELISA.</p> <p>3. To separate nitrogenous bases by paper chromatography.</p> <p>4. To separate sugars by thin layer chromatography.</p> <p>5. Isolation of chloroplasts by differential centrifugation.</p> <p>6. To separate chloroplast pigments by column chromatography.</p> <p>7. To estimate protein concentration through Lowry's methods. 8. To separate proteins using PAGE.</p> <p>9. To separation DNA (marker) using AGE.</p> <p>10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).</p> <p>11. Preparation of permanent slides (double staining)</p>	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

**Curriculum Plan (ODD SEMESTER)
(Botany Honours; CBCS)**

Semester I (AY 2017-2020)		Period: to		
Paper: CC 1T(Phycology and Microbiology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to microbial world : Microbial nutrition, growth and metabolism. Economic importance of viruses with reference to vaccine production, role in research, medicine and diagnostics, as causal organisms of plant diseases. Economic importance of bacteria with reference to their role in agriculture and industry (fermentation and medicine).	(7 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Viruses Discovery, physiochemical and biological characteristics; classification (Baltimore), general structure with special reference to viroids and prions; replication (general account), DNA virus (T-phage), lytic and lysogenic cycle; RNA virus (TMV).	(7 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Bacteria Discovery, general characteristics; Types-archaebacteria, eubacteria, wall-less forms (mycoplasma and spheroplasts); Cell structure; Nutritional types; Reproduction-vegetative, asexual and recombination (conjugation, transformation and transduction).	(7 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Algae General characteristics; Ecology and distribution; range of thallus organization; Cell structure and components; cell wall, pigment system, reserve food (of only groups represented in the syllabus), flagella; methods of reproduction; Classification; criteria, system of Fritsch, and evolutionary classification of Lee (only upto groups) and Van – den Hoek et.al(1982); Significant contributions of important phycologists (F.E. Fritsch, G.M. Smith, R.N. Singh, T.V. Desikachary, H.D. Kumar, M.O.P. Iyengar). Role of algae in the environment, agriculture, biotechnology and industry.	(11 lectures)	Susanta Kumar Maity	
5	Unit 5: Cyanophyta and Xanthophyta Ecology and occurrence; Range of thallus organization; Cell structure; Reproduction, Morphology and life-cycle of Nostoc and Vaucheria.	(8 lectures)	Susanta Kumar Maity	
6	Unit 6: Chlorophyta and Charophyta General characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Chlamydomonas</i> , <i>Volvox</i> , <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> . Evolutionary significance of <i>Prochloron</i> .	(8 lectures)	Susanta Kumar Maity	
7	Unit 7: Phaeophyta and Rhodophyta: Characteristics; Occurrence; Range of thallus organization; Cell structure; Reproduction. Morphology and life-cycles of <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> .	(12 lectures)	Susanta Kumar Maity	

Semester I (AY 2017-2020)		Period: to		
Paper: CC 1P (Phycology and Microbiology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark

1	Microbiology 1. Electron micrographs/Models of viruses – T-Phage and TMV, Line drawings/ Photographs of Lytic and Lysogenic Cycle. 2. Types of Bacteria to be observed from temporary/permanent slides/photographs. Electron micrographs of bacteria, binary fission, endospore, conjugation, root Nodule. 3. Gram staining. 4. Endospore staining with malachite green using the (endospores taken from soil bacteria). 5. Study of bacteria from root nodules/Curd sample.	20	SkMd Ismail Al Amin	
2	Phycology Study of vegetative and reproductive structures of Nostoc, <i>Chlamydomonas</i> (electron micrographs), Volvox, <i>Oedogonium</i> , <i>Coleochaete</i> , <i>Chara</i> , <i>Vaucheria</i> , <i>Ectocarpus</i> , <i>Fucus</i> and <i>Polysiphonia</i> , <i>Prochloron</i> through electron micrographs, temporary preparations and permanent slides.	20	Susanta Kumar Maity	

Semester I (AY 2017-2020)		Period: to		
Paper: CC 2T (Biomolecules and Cell Biology) (Theory)		Full Marks: 40+15		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biomolecules: Types and significance of chemical bonds; Structure and properties of water; pH and buffers. Carbohydrates: Nomenclature and classification; Monosaccharides ; Disaccharides; Oligosaccharides and polysaccharides. Lipids: Definition and major classes of storage and structural lipids; Fatty acids structure and functions; Essential fatty acids; Triacylglycerols structure, functions and properties; Phosphoglycerides. Proteins: Structure of amino acids; Levels of protein structure-primary, secondary, tertiary and quarternary; Protein denaturation and biological roles of proteins. Nucleic acids: Structure of nitrogenous bases; Structure and function of nucleotides; Types of nucleic acids; Structure of A, B, Z types of DNA; Types of RNA; Structure of tRNA.	(20 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Bioenergetics : Laws of thermodynamics, concept of free energy, endergonic and exergonic reactions, coupled reactions, redox reactions. ATP: structure, its role as a energy currency molecule.	(4 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Enzymes: Structure of enzyme: holoenzyme, apoenzyme, cofactors, coenzymes and prosthetic group; Classification of enzymes; Features of active site, substrate specificity, mechanism of action (activation energy, lock and key hypothesis, induced - fit theory), Michaelis – Menten equation, enzyme inhibition and factors affecting enzyme activity.	(6 lectures)	Dr. Nilay Kumar Maitra	
4	Unit4: The cell: Cell as a unit of structure and function;	(4	Dr. Nilay	

	Characteristics of prokaryotic and eukaryotic cells; Origin of eukaryotic cell (Endosymbiotic theory).	lectures)	Kumar Maitra	
5	Unit 5: Cell wall and plasma membrane: Chemistry, structure and function of Plant cell wall. Overview of membrane function; fluid mosaic model; Chemical composition of membranes; Membrane transport – Passive, active and facilitated transport, endocytosis and exocytosis.	(4 lectures)	Dr. Nilay Kumar Maitra	
6	Unit 6: Cell organelles: Nucleus: Structure-nuclear envelope, nuclear pore complex, nuclear lamina, molecular organization of chromatin; nucleolus. Cytoskeleton: Role and structure of microtubules, microfilaments and intermediary filament. Chloroplast, mitochondria and peroxisomes: Structural organization; Function; Semiautonomous nature of mitochondria and chloroplast. Endomembrane system: Endoplasmic Reticulum – Structure, targeting and insertion of proteins in the ER, protein folding, processing; Smooth ER and lipid synthesis, export of proteins and lipids; Golgi Apparatus – organization, protein glycosylation, protein sorting and export from Golgi Apparatus; Lysosomes	(16 lectures)	Dr. Nilay Kumar Maitra	
7	Unit 7: Cell division: Phases of eukaryotic cell cycle, mitosis and meiosis; Regulation of cell cycle- checkpoints, role of protein kinases.	(6 lectures)	Dr. Nilay Kumar Maitra	

Semester I (AY 2017-2020)		Period: to		
Paper: CC 2P (: Biomolecules and Cell Biology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTED	Class taken by	Remark
1	1. Qualitative tests for carbohydrates, reducing sugars, non-reducing sugars, lipids and proteins.	(30 lectures)	Dr. Nilay Kumar Maitra	
2	2. Study of plant cell structure with the help of epidermal peel mount of Onion/Rhoeo /Crinum.		Dr. Nilay Kumar Maitra	
3	3. Demonstration of the phenomenon of protoplasmic streaming in Hydrilla leaf.		Dr. Nilay Kumar Maitra	
4	4. Measurement of cell size by the technique of micrometry.		Dr. Nilay Kumar Maitra	
5	5. Counting the cells per unit volume with the help of haemocytometer. (Yeast/pollen grains).		Dr. Nilay Kumar Maitra	
6	6. Study of cell and its organelles with the help of electron micrographs.		Dr. Nilay Kumar Maitra	

7	7. Cytochemical staining of : DNA- Feulgen Actocarmin and AcetoOrcrin stain and cell wall in the epidermal peel of onion using Periodic Schiff's (PAS) staining technique.		Dr. Nilay Kumar Maitra	
8	8. Study the phenomenon of plasmolysis and deplasmolysis.		Dr. NilayKumar Maitra	
9	9. Study the effect of organic solvent and temperature on membrane permeability.		Dr. Nilay Kumar Maitra	
10	10. Study different stages of mitosis and meiosis.		Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester II (AY 2017-2020)		Period: _____ to _____		
Paper: CC 3T (Mycology and Phytopathology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to true fungi: General characteristics; Affinities with plants and animals; Thallus organization; Cell wall composition; Nutrition; Classification.	(6 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Chytridiomycota and Zygomycota: Characteristic features; Ecology and significance; Thallus organisation; Reproduction; Life cycle with reference to Synchytrium, Rhizopus .	(5 lecture)	Dr. Nilay Kumar Maitra	
3	Unit 3: Ascomycota: General characteristics (asexual and sexual fruiting bodies); Ecology; Life cycle, Heterokaryosis and parasexuality; Life cycle and classification with reference to Saccharomyces, Aspergillus, Penicillium, Alternaria, Neurospora and Peziza.	(10 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Basidiomycota :General characteristics; Ecology; Life cycle and Classification with reference to black stem rust on wheat Puccinia (Physiological Specialization), loose and covered smut (symptoms only), Agaricus; Bioluminescence, Fairy Rings and Mushroom Cultivation with special reference to Oyster Mashroom.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Allied Fungi: General characteristics; Status of Slime molds, Classification; Occurrence; Types of plasmodia; Types of fruiting bodies.	(3 lectures)	Dr. Nilay Kumar Maitra	
6	Unit 6: Oomycota: General characteristics; Ecology; Life cycle and classification with reference to Phytophthora, Albugo.	(4 lectures)	Dr. Nilay Kumar Maitra	
7	Unit 7: Symbiotic associations Lichen: – Occurrence; General characteristics; Growth forms and range of thallus organization; Nature of associations of algal and fungal partners; Reproduction; Mycorrhiza-Ectomycorrhiza, Endomycorrhiza	(4 lectures)	Dr. Nilay Kumar Maitra	

	and their significance.			
8	Unit 8: Applied Mycology: Role of fungi in biotechnology; Application of fungi in food industry (Flavour & texture, Fermentation, Baking, Organic acids, Enzymes, Mycoproteins); Secondary metabolites (Pharmaceutical preparations); Agriculture (Biofertilizers); Mycotoxins; Biological control (Mycofungicides, Mycoherbicides, Mycoinsecticides, Myconematicides); Medical mycology.	(10 Lectures)	Dr. Nilay Kumar Maitra	
9	Unit 9: Phytopathology: Terms and concepts; General symptoms; Geographical distribution of diseases; Etiology; Symptomology; Host-Pathogen relationships; Disease cycle and environmental relation; prevention and control of plant diseases, and role of quarantine.	(10 lectures)	Dr. Nilay Kumar Maitra	
10	Bacterial diseases :- Citrus canker and angular leaf spot of cotton. Viral diseases – Tobacco Mosaic viruses, vein clearing. Fungal diseases – Early blight of potato, Black stem rust of wheat, White rust of crucifers.	(10 lectures)	SkMdIsmail Al Amin	

Semester II (AY 2017-2020)		Period: to		
Paper: CC 3P(Mycology and Phytopathology)(Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Introduction to the world of fungi (Unicellular, coenocytic/septate mycelium, ascocarps&basidiocarps).	(30 lectures)	Dr. Nilay Kumar Maitra	
2	2. Rhizopus: study of asexual stage from temporary mounts and sexual structures through permanent slides.		Dr. Nilay Kumar Maitra	
3	3. Aspergillus and Penicillium: study of asexual stage from temporary mounts. Study of Sexual stage from permanent slides/photographs.		Dr. Nilay Kumar Maitra	
4	4. Peziza: Ascobulus sectioning through ascocarp.		Dr. Nilay Kumar Maitra	
5	5. Alternaria: Specimens/photographs and temporary mounts.		Dr. Nilay Kumar Maitra	
6	6. Puccinia: Herbarium specimens of Black Stem Rust of Wheat and infected Barberry leaves; sections/ mounts of spores on wheat and permanent slides of both the hosts.		Dr. Nilay Kumar Maitra	
7	7. Agaricus: Specimens of button stage and full grown mushroom; sectioning of gills of Agaricus, fairy rings and bioluminescent mushrooms to be shown.		Dr. Nilay Kumar Maitra	
8	8. Study of phaneroplasmodium from actual specimens and /or photograph. Study of Stemonitis sporangia.		Dr. Nilay Kumar Maitra	

9	9. Albugo: Study of symptoms of plants infected with Albugo; asexual phase study through section/ temporary mounts and sexual structures through permanent slides.		Dr. Nilay Kumar Maitra	
10	10. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) on different substrates. Study of thallus and reproductive structures (soredia and apothecium) through permanent slides. Mycorrhizae: ectomycorrhiza and endomycorrhiza (Photographs)		Dr. Nilay Kumar Maitra	
11	11. Phytopathology : Herbarium specimens of bacterial diseases; Citrus Canker; Angular leaf spot of cotton, Viral diseases: TMV, Vein clearing, Fungal diseases: Early blight of potato, Black stem rust of wheat and White rust of crucifers.	(10 lectures)	SkMd Ismail Al Amin	

Semester II (AY 2017-2020)		Period: _____ to _____		
Paper: CC 4T (Archegoniate) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction: Unifying features of archegoniate; Transition to land habit; Alternation of generations.	(4 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Bryophytes: General characteristics; Adaptations to land habit; Classification; Range of thallus organization.	(6 lectures)	SkMd Ismail Al Amin	
3	Unit 3: Type Studies:- Bryophytes Classification (up to family), morphology, anatomy and reproduction of Riccia, Marchantia, Pellia, Porella, Anthoceros, Sphagnum and Funaria; Pogonatum, Reproduction and evolutionary trends in Riccia, Marchantia, Plagichasma Anthoceros and Funaria (developmental stages not included). Ecological and economic importance of bryophytes with special reference to Sphagnum.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Pteridophytes: General characteristics; Classification; Early land plants (Cooksonia and Rhynia).	(6 lectures)	Susanta Kumar Maity	
5	Unit 5: Type Studies:- Pteridophytes Classification (up to family), morphology, anatomy and reproduction of Psilotum, Selaginella, Equisetum and Pteris (Developmental details not to be included). Apogamy, and apospory, heterospory and seed habit, telome theory, stelar evolution; Ecological and economic importance.	(14 lectures)	Susanta Kumar Maity	
6	Unit 6: Gymnosperms: General characteristics, classification (up to family), morphology, anatomy and reproduction of Cycas, Pinus and Gnetum (Developmental details not to be included); Ecological and economic importance.	(18 lectures)	Susanta Kumar Maity	

Semester II (AY 2017-2020)		Period: _____ to _____		
Paper: CC 4P (Archegoniate) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Riccia – Morphology of thallus.	(15 lectures)		
2	2. Marchantia- Morphology of thallus, whole mount of rhizoids & Scales, vertical section of thallus through Gemma cup, whole mount of Gemmae (all temporary slides), vertical section of Antheridiophore, Archegoniophore, longitudinal section of Sporophyte (all permanent slides).		SkMd Ismail Al Amin	
3	3. Anthoceros- Morphology of thallus, dissection of sporophyte (to show stomata, spores, pseudoelaters, columella) (temporary slide), vertical section of thallus (permanent slide).		SkMd Ismail Al Amin	
4	4. Pellia, Porella- Permanent slides.		SkMd Ismail Al Amin	
5	5. Sphagnum- Morphology of plant, whole mounts of leaf (permanent slide only).		SkMd Ismail Al Amin	
6	6. Funaria- Pogonatum/ Polytrichum Morphology, whole mount of leaf, rhizoids, operculum, peristome, annulus, spores (temporary slides); permanent slides showing antheridial and archegonial heads, longitudinal section of capsule and protonema.		SkMd Ismail Al Amin	
7	7. Psilotum- Study of specimen, transverse section of synangium (permanent slide).	(15 lectures)	Susanta Kumar Maity	
8	8. Selaginella- Morphology, whole mount of leaf with ligule, transverse section of stem, whole mount of strobilus, whole mount of microsporophyll and megasporophyll (temporary slides), longitudinal section of strobilus (permanent slide).		Susanta Kumar Maity	
9	9. Equisetum- Morphology, transverse section of internode, longitudinal section of strobilus, transverse section of strobilus, whole mount of sporangiophore, whole mount of spores (wet and dry) (temporary slide), transverse section of rhizome (permanent slide).		Susanta Kumar Maity	
10	10. Pteris- Morphology, transverse section of rachis, vertical section of sporophyll, whole mount of sporangium, whole mount of spores (temporary slides), transverse section of rhizome, whole mount of prothallus with sex organs and young sporophyte (permanent slide).		Susanta Kumar Maity	
11	11. Cycas- Morphology (coralloid roots, bulbil, leaf), whole mount of microsporophyll, transverse section of coralloid root, transverse section of rachis, vertical section of leaflet, vertical section of microsporophyll, whole mount of spores (temporary slides), longitudinal section of ovule, transverse section of root (permanent slide).		Susanta Kumar Maity	
12	12. Pinus- Morphology (long and dwarf shoots, whole mount of dwarf shoot, male and female cones), transverse section of Needle, transverse section of stem, longitudinal section of / transverse section of male cone, whole mount of microsporophyll, whole mount of Microspores (temporary slides), longitudinal section of female cone, tangential longitudinal section & radial longitudinal sections stem (permanent slide).		Susanta Kumar Maity	
13	13. Gnetum- Morphology (stem, male & female cones), transverse section of stem, vertical section of ovule (permanent slide)		Susanta Kumar Maity	

14	14. Botanical excursion		Susanta Kumar Maity	
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**Curriculum Plan (ODD SEMESTER)
(Botany Honours; CBCS)**

Semester III (AY 2017-2020)		Period: _____ to _____		
Paper: CC5T (Anatomy of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction and scope of Plant Anatomy: Applications in systematics, forensics and pharmacognosy.	(4 Lectures)	Susanta Kumar Maity	
2	Unit 2: Structure and Development of Plant Body Internal organization of plant body: The three tissue systems, types of cells and tissues. Development of plant body: polarity, cytodifferentiation and organogenesis during embryogenic development, Root-stem transition, Nodal anatomy – Basic concept.	(6 Lectures)	Susanta Kumar Maity	
3	Unit 3: Tissues Classification of tissues; Simple and complex tissues (no phylogeny); cytodifferentiation of tracheary elements and sieve elements; Pits and plasmodesmata; Wall ingrowths and transfer cells, adcrustation and incrustation, Ergastic substances. Hydathodes, cavities, lithocysts and laticifers.	(12 Lectures)	Susanta Kumar Maity	
4	Unit 4: Apical meristems: Evolution of concept of organization of shoot apex (Apical cell theory, Histogen theory, Tunica Corpus theory, continuing meristematic residue, cytohistological zonation); Types of vascular bundles; Structure of dicot and monocot stem. Origin, development, arrangement and diversity in size and shape of leaves; Structure of dicot and monocot leaf, Kranz anatomy. Organization of root apex (Apical cell theory, Histogen theory, Korper-Kappe theory); Quiescent centre; Root cap; Structure of dicot and monocot root; Endodermis, exodermis and origin of lateral root.	(15 Lectures)	Susanta Kumar Maity	
5	Unit 5: Vascular Cambium and Wood Structure, function and seasonal activity of cambium; Secondary growth in root and stem. Anomalous secondary growth in Bignonia, Boerhaavia, Aristolochia and Dracaena. Axially and radially oriented elements; Types of rays and axial parenchyma; Cyclic aspects and reaction wood; Sapwood and heartwood; Ring and diffuse porous wood; Early and late wood, tyloses; Dendrochronology. Development and composition of periderm, rhytidome and lenticels.	(15 Lectures)	Susanta Kumar Maity	
6	Unit 6: Adaptive and Protective Systems Epidermal tissue system, cuticle, epicuticular waxes, trichomes(uni-and multicellular, glandular and nonglandular, two examples of each), stomata (classification); Adcrustation and incrustation; Anatomical adaptations of xerophytes and hydrophytes. Mechanical tissue – distribution and significance.	(8 Lectures)	Susanta Kumar Maity	

Semester III (AY 2017-2020)		Period: to		
Paper: CC5P (Anatomy of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSE S ALLOTE D	Class taken by	Remark
1	<p>1. Study of anatomical details through permanent slides/temporary stain mounts/ macerations/museum specimens with the help of suitable examples.</p> <p>2. Apical meristem of root, shoot and vascular cambium</p> <p>3. Distribution and types of parenchyma, collenchyma and sclerenchyma.</p> <p>4. Xylem: Tracheary elements-tracheids, vessel elements; thickenings; perforation plates; xylem fibres.</p> <p>5. Wood: ring porous; diffuse porous; tyloses; heart- and sapwood.</p> <p>6. Phloem: Sieve tubes-sieve plates; companion cells; phloem fibres.</p> <p>7. Epidermal system: cell types, stomata types; trichomes: non-glandular and glandular</p> <p>8. Root: monocot, dicot, secondary growth.</p> <p>9. Stem: monocot, dicot - primary and secondary growth; periderm; lenticels.</p> <p>10. Leaf: isobilateral, dorsiventral, C4 leaves (Kranz anatomy).</p> <p>11. Adaptive Anatomy: xerophytes, hydrophytes.</p> <p>12. Secretory tissues: cavities, lithocysts and laticifers.</p>	(20 Lectur es)	Susanta Kumar Maity	

Semester III (AY 2017-2020)		Period: _____ to _____		
Paper: CC6T (Economic Botany) (Theory)		Full Marks: 40		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Origin of Cultivated Plants: Concept of Centres of Origin, their importance with reference to Vavilov's work. Examples of major plant introductions; Crop domestication and loss of genetic diversity; evolution of new crops/varieties, importance of germplasm diversity.</p> <p>Unit 2: Cereals: Wheat and Rice (origin, morphology, cultivation, management processing & uses); Brief account of millets.</p> <p>Unit 3: Legumes: Origin, morphology cultivation, management and uses of Chick pea, Pigeon pea and fodder legumes. Importance to man and ecosystem.</p> <p>Unit 4: Sources of sugars and starches: (Morphology cultivation, management and processing of sugarcane, products and by-products of sugarcane industry. Potato – morphology, propagation & uses.</p> <p>Unit 5: Spices: Listing of important spices, their family and part used. Economic importance with special reference to fennel, saffron, clove and black pepper</p> <p>Unit 6: Beverages: Tea, Coffee (morphology, processing & uses)</p> <p>Unit 7: Sources of oils and fats :General description, classification, extraction, their uses and health implications groundnut, coconut, linseed, soybean, mustard and coconut (Botanical name, family & uses). Essential Oils: General account, extraction methods, comparison with fatty oils & their uses.</p> <p>Unit 8: Natural Rubber: Para-rubber: tapping, processing and uses.</p> <p>Unit 9: Drug-yielding plants :Therapeutic and habit-forming drugs with special reference to Cinchona, Digitalis, Papaver and Cannabis; Tobacco (Morphology, processing, uses and health hazards).</p> <p>Unit 10: Timber plants: General account with special reference to teak and pine.</p> <p>Unit 11: Fibers: Classification based on the origin of fibers; Cotton, Coir and Jute (morphology, extraction and uses).</p>	(60 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2017-2020)		Period: _____ to _____		
Paper: CC6P (Economic Botany) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Cereals: Wheat (habit sketch, L. S/T.S. grain, starch grains, micro-chemical tests) Rice (habit sketch, study of paddy and grain, starch grains, micro-chemical tests).</p> <p>2. Legumes: Soybean, Groundnut, (habit, fruit, seed structure, micro-chemical tests).</p> <p>3. Sources of sugars and starches: Sugarcane (habit sketch; cane juice-micro-chemical tests), Potato (habit sketch, tuber morphology, T.S. tuber to show localization of starch grains, w.m. starch grains, micro-chemical tests).</p> <p>4. Spices: Black pepper, Fennel and Clove (habit and sections).</p> <p>5. Beverages: Tea (plant specimen, tea leaves), Coffee (plant specimen, beans).</p> <p>6. Sources of oils and fats: Coconut- T.S. nut, Mustard-plant specimen, seeds; tests for fats in crushed seeds.</p> <p>7. Essential oil-yielding plants: Habit sketch of Rosa, Vetiveria, Santalum and Eucalyptus (specimens/photographs).</p> <p>8. Rubber: specimen, photograph/model of tapping, samples of rubber products.</p> <p>9. Drug-yielding plants: Specimens of Digitalis, Papaver and Cannabis.</p> <p>10. Tobacco: specimen and products of Tobacco.</p> <p>11. Woods: Tectona, Pinus: Specimen, Section of young stem.</p> <p>12. Fiber-yielding plants: Cotton (specimen, whole mount of seed to show lint and fuzz; whole mount of fiber and test for cellulose), Jute (specimen, transverse section of stem, test for lignin on transverse section of stem and fiber).</p>	(24 lectures)	Dr. Nilay Kumar Maitra	

Semester III (AY 2017-2020)		Period: _____ to _____		
Paper: CC7T (Genetics) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Mendelian genetics and its extension Mendelism: History; Principles of inheritance; Chromosome theory of inheritance; Autosomes and sex chromosomes; Probability and pedigree analysis; Incomplete dominance and codominance; Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, Recessive and Dominant traits, Penetrance and Expressivity, Numericals; Polygenic inheritance.	(16 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Extrachromosomal Inheritance Chloroplast mutation: Variegation in Four o'clock plant; Mitochondrial mutations in yeast; Maternal effects-shell coiling in snail; Infective heredity- Kappa particles in Paramecium.	(6 lectures)	SkMd Ismail Al Amin	

3	Unit 3: Linkage, crossing over and chromosome mapping Linkage and crossing over-Cytological and molecular basis of crossing over; Recombination frequency, two factor and three factor crosses; Interference and coincidence; Numericals based on gene mapping; Sex Linkage.	(12 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Variation in chromosome number and structure Deletion, Duplication, Inversion, Translocation, Position effect, Euploidy and Aneuploidy	(8 lectures)	SkMd Ismail Al Amin	
5	Unit 5: Gene mutations Types of mutations; Molecular basis of Mutations; Mutagens – physical and chemical (Base analogs, deaminating, alkylating and intercalating agents); Detection of mutations: ClB method. Role of Transposons in mutation.DNA repair mechanisms.	(6 lectures)	SkMd Ismail Al Amin	
6	Unit 6: Fine structure of gene Classical vs molecular concepts of gene; Cis-Trans complementation test for functional allelism; Structure of Phage T4, rII Locus.	(6 lectures)	SkMd Ismail Al Amin	
7	Unit 6. Population and Evolutionary Genetics Allele frequencies, Genotype frequencies, Hardy-Weinberg Law, role of natural selection, mutation, genetic drift. Genetic variation and Speciation.	(6 lectures)	SkMd Ismail Al Amin	

Semester III (AY 2017-2020)		Period: _____ to _____		
Paper: CC7P (Genetics) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Demonstration on pretreatment, fixation, staining and squash and smear preparation.	(40 lectures)	SkMd Ismail Al Amin	
2	2. Study of Mitosis from Onion / Garlic / Lentil root.		SkMd Ismail Al Amin	
3	3. Study of Meiosis with pollen mother cell (PMC) of Onion / Solanum / Datura by smear preparation.		SkMd Ismail Al Amin	
4	4. Mendel's laws through seed ratios. Laboratory exercises in probability and chi-square.		SkMd Ismail Al Amin	
5	5. Chromosome mapping using point test cross data.		SkMd Ismail Al Amin	
6	6. Pedigree analysis for dominant and recessive autosomal and sex linked traits		SkMd Ismail Al Amin	
7	7. Incomplete dominance and gene interaction through seed ratios (9:7, 9:6:1, 13:3, 15:1, 12:3:1, 9:3:4).		SkMd Ismail Al Amin	
8	8. Blood Typing: groups & Rh factor.		SkMd Ismail Al Amin	

9	9. Study of aneuploidy: Down's, Klinefelter's and Turner's syndromes.		SkMd Ismail Al Amin	
10	10. Photographs/Permanent Slides showing Translocation Ring, Laggards and Inversion Bridge.		SkMd Ismail Al Amin	
11	11. Study of human genetic traits: Sickle cell anemia, Xeroderma Pigmentosum, Albinism, red-green Colour blindness, Widow's peak, Rolling of tongue, Hitchhiker's thumb and Attached ear lobe		SkMd Ismail Al Amin	

Semester III (AY 2017-2020)		Period: to		
Paper: SEC1T (Biofertilizers) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.	(4 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.	(8 lectures)	Dr. Nilay Kumar Maitra	
3	Unit 3: Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.	(4 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.	(8 lectures)	Dr. Nilay Kumar Maitra	
5	Unit 5: Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.	(6 lectures)	Dr. Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester IV (AY 2017-2020)		Period: to		
Paper: CC8T (Molecular Biology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit- 1: Nucleic acids: Carriers of genetic information Historical perspective; DNA as the carrier of genetic information (Griffith's, Hershey	(60	SkMd Ismail	

	& Chase, Avery, McLeod & McCarty, Fraenkel-Conrat's experiment.	lectures)	Al Amin	
2	Unit -2. The Structures of DNA and RNA / Genetic Material DNA Structure: Miescher to Watson and Crick- historic perspective, DNA structure, Salient features of double helix, Types of DNA, Types of genetic material, denaturation and renaturation, cot curves; Organization of DNA-Prokaryotes, Viruses, Eukaryotes. RNA Structure- Organelle DNA -- mitochondria and chloroplast DNA. The Nucleosome Chromatin structure- Euchromatin, Heterochromatin- Constitutive and Facultative heterochromatin.			
3	Unit- 2: The replication of DNA Chemistry of DNA synthesis (Kornberg's discovery); General principles – bidirectional, semiconservative and semi discontinuous replication, RNA priming; Various models of DNA replication, including rolling circle, θ (theta) mode of replication, replication of linear ds-DNA, replication of the 5' end of linear chromosome; Enzymes involved in DNA replication.			
4	Unit- 3: Central dogma and genetic code Key experiments establishing- The Central Dogma (Adaptor hypothesis and discovery of mRNA template), Genetic code (deciphering & salient features)			
5	Unit 4: Transcription Transcription in prokaryotes and eukaryotes. Principles of transcriptional regulation; Prokaryotes: Regulation of lactose metabolism and tryptophan synthesis in E.coli. Eukaryotes: transcription factors, heat shock proteins, steroids and peptide hormones; Gene silencing.	(60 lectures)	Susanta Kumar Maity	
6	Unit 5: Processing and modification of RNA Split genes-concept of introns and exons, removal of introns, spliceosome machinery, splicing pathways, group I and group II intron splicing, alternative splicing eukaryotic mRNA processing (5' cap, 3' polyA tail); Ribozymes; RNA editing and mRNA transport.			
7	Unit 6: Translation Ribosome structure and assembly, mRNA; Charging of tRNA, aminoacyl tRNA synthetases; Various steps in protein synthesis, proteins involved in initiation, elongation and termination of polypeptides; Fidelity of translation; Inhibitors of protein synthesis; Post-translational modifications of proteins.			

Semester IV (AY 2017-2020)		Period: _____ to _____		
Paper: CC8P (Molecular Biology) (Practical)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Preparation of LB medium and raising E.Coli.	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	
	2. Isolation of genomic DNA from <i>E. Coli</i> .			
	3. DNA isolation from cauliflower head.			
	4. DNA estimation by diphenylamine reagent/UV Spectrophotometry.			
	5. Study of DNA replication mechanisms through photographs (Rolling circle, Theta replication and semi-discontinuous replication).			
	6. Study of structures of prokaryotic RNA polymerase and eukaryotic RNA polymerase II through photographs			
	7. Photographs establishing nucleic acid as genetic material (Messelson and Stahl's, Avery et al, Griffith's, Hershey & Chase's and Fraenkel & Conrat's experiments)			
	8. Study of the following through photographs: Assembly of Spliceosome			

	machinery; Splicing mechanism in group I & group II introns; Ribozyme and Alternative splicing.			
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Semester IV (AY 2017-2020)		Period: to		
Paper: CC9T (Plant Ecology and Phytogeography) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Basic concepts; Levels of organization. Inter-relationships between the living world and the environment, the components and dynamism, homeostasis.	(60 lectures)	Dr. Nilay Kumar Maitra	
2	Unit 2: Soil Importance; Origin; Formation; Composition; Physical; Chemical and Biological components; Soil profile; Role of climate in soil development.		Dr. Nilay Kumar Maitra	
3	Unit 3: Water Importance: States of water in the environment; Atmospheric moisture; Precipitation types (rain, fog, snow, hail, dew); Hydrological Cycle; Water in soil; Water table.		Dr. Nilay Kumar Maitra	
4	Unit 4: Light, temperature, wind and fire Variations; adaptations of plants to their variation.		Dr. Nilay Kumar Maitra	
5	Unit 5: Ecosystems Structure; Processes; Trophic organisation; Food chains and Food webs; Ecological pyramids.		Dr. Nilay Kumar Maitra	
6	Unit 6: Population ecology Characteristics and Dynamics .Ecological Speciation		Dr. Nilay Kumar Maitra	
7	Unit 7: Plant communities Concept of ecological amplitude; Habitat and niche; Characters: analytical and synthetic; Ecotone and edge effect; Dynamics: succession – processes, types; climax concepts.		Dr. Nilay Kumar Maitra	
8	Unit 8: Biotic interactions Trophic organization, basic source of energy, autotrophy, heterotrophy; symbiosis, commensalism, parasitism; food chains and webs; ecological pyramids; biomass, standing crop.		Dr. Nilay Kumar Maitra	
9	Unit 9: Functional aspects of ecosystem Principles and models of energy flow; Production and productivity; Ecological efficiencies; Biogeochemical cycles; Cycling of Carbon,		Dr. Nilay Kumar Maitra	

	Nitrogen and Phosphorus.			
10	Unit 10: Phytogeography Principles; Continental drift; Theory of tolerance; Endemism; Brief description of major terrestrial biomes (one each from tropical, temperate & tundra); Phytogeographical division of India; Local Vegetation.		Dr. Nilay Kumar Maitra	

Semester IV (AY 2017-2020)		Period: to		
Paper: CC9P (Plant Ecology and Phytogeography) (Practical)		Full Marks: Credit:		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	(36 lectures)	Dr. Nilay Kumar Maitra	
2	2. Determination of pH of various soil and water samples (pH meter, universal indicator/Lovibond comparator and pH paper)		Dr. Nilay Kumar Maitra	
3	3. Analysis for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency from		Dr. Nilay Kumar Maitra	
4	4. two soil samples by rapid field tests.		Dr. Nilay Kumar Maitra	
5	5. Determination of organic matter of different soil samples by Walkley& Black rapid titration		Dr. Nilay Kumar Maitra	
6	6. method		Dr. Nilay Kumar Maitra	
7	7. Comparison of bulk density, porosity and rate of infiltration of water in soils of three habitats.		Dr. Nilay Kumar Maitra	
8	8. Determination of dissolved oxygen of water samples from polluted and unpolluted sources.		Dr. Nilay Kumar Maitra	
9	9. (a). Study of morphological adaptations of hydrophytes and xerophytes (four each). (b). Study of biotic interactions of the following: Stem parasite (Cuscuta), Root parasite (Orobanchae) Epiphytes, Predation (Insectivorous plants).		Dr. Nilay Kumar Maitra	
10	10. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus, by species area curve method (species to be listed).		Dr. Nilay Kumar Maitra	
11	11. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law.		Dr. Nilay Kumar Maitra	

12	12. Quantitative analysis of herbaceous vegetation for density and abundance in the college campus. 13. Field visit to familiarise students with ecology of different sites.		Dr. Nilay Kumar Maitra	
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Semester IV (AY 2017-2020)		Period: to		
Paper: CC10T (Plant Systematics) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Significance of Plant systematics Introduction to systematics; Plant identification, Classification, Nomenclature. Evidences from palynology, cytology, phytochemistry and molecular data. Field inventory; Functions of Herbarium; Important herbaria and botanical gardens of the world and India; Virtual herbarium; E-flora; Documentation: Flora, Monographs, Journals; Keys:Single access and Multi-access.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Taxonomic hierarchy Concept of taxa (family, genus, species); Categories and taxonomic hierarchy; Species concept (taxonomic, biological, evolutionary).		Susanta Kumar Maity	
3	Unit 3: Botanical nomenclature Principles and rules (ICN); Ranks and names; Typification, author citation, valid publication, rejection of names, principle of priority and its limitations; Names of hybrids.		Susanta Kumar Maity	
4	Unit 4: Systems of classification Major contributions of Theophrastus, Bauhin, Tournefort, Linnaeus, Adanson, de Candolle, Bessey, Hutchinson, Takhtajan and Cronquist; Classification systems of Bentham and Hooker (upto series) and Engler and Prantl (upto series); Brief reference of Angiosperm Phylogeny Group (APG III) classification.		Susanta Kumar Maity	
5	Unit 5: Biometrics, numerical taxonomy and cladistics Characters; Variations; OTUs, character weighting and coding; Cluster analysis; Phenograms, cladograms (definitions and differences).		Susanta Kumar Maity	
6	Unit 6: Phylogeny of Angiosperms Terms and concepts (primitive and advanced, homology and analogy, parallelism and convergence, monophyly, Paraphyly, polyphyly and clades). Origin and evolution of angiosperms; Co-evolution of angiosperms and animals; Methods of illustrating evolutionary relationship (phylogenetic tree, cladogram).		Susanta Kumar Maity	

Semester IV (AY 2017-2020)		Period: to		
Paper: CC10P (Plant Systematics) (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of vegetative and floral characters of the following	(36)	Susanta Kumar	

	<p>families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification):</p> <ol style="list-style-type: none"> 1. Ranunculaceae - Ranunculus, Delphinium. 2. Brassicaceae - Brassica, Alyssum / Iberis. 3. Malvaceae – Sida Sp. Urenalobota. 4. Myrtaceae - Eucalyptus, Callistemon 5. Umbelliferae - Coriandrum /Anethum / Foeniculum. 6. Asteraceae - Sonchus/Launaea, Vernonia/Ageratum, Eclipta/Tridax. 7. Solanaceae - Solanum nigrum/Withania, Nicotina, Plumbaginefolia. 8. Lamiaceae - Salvia/Ocimum. 9. Euphorbiaceae - Euphorbia hirta/E.milii, Jatropha. 10. Fasaceae – TephrosiaSp.,Crotalaria Sp., 11. Caesalpineaeceae – Cassia Sp., 12. Asclepiadaeaceae- PesgulariaGygnema, 13. Apocynaceae – Hollorhen, Catharanthus. 14. Rubiaceae – Oldenladeae, Spermoeoceae, 15. Liliaceae - Asphodelus/Lilium/Allium. 16. Poaceae - Triticum/Hordeum/Avena. 	lectures)	Maity	
2	2. Field visit (local) – Subject to grant of funds from the university.		Susanta Kumar Maity	
3	3. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).		Susanta Kumar Maity	

Semester IV (AY 2017-2020)		Period: _____ to _____		
Paper: SEC2T (Mushroom Culture Technology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms.Types of edible mushrooms available in India - <i>Volvariellavolvacea</i> , <i>Pleurotuscitrinopileatus</i> , <i>Agaricusbisporus</i> .	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove,		Dr.Nilay Kumar	

	sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.		Maitra	
3	Unit 3: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.		Dr.Nilay Kumar Maitra	
4	Unit 4: Food Preparation:Types of foods prepared from mushroom.Research Centres - National level and Regional level.Cost benefit ratio - Marketing in India and abroad, Export Value.		Dr.Nilay Kumar Maitra	

Curriculum Plan (Botany Honours; CBCS)

Semester V (AY 2017-2020)		Period: to		
Paper: CC11T (Reproductive Biology of Angiosperms) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction :History (contributions of G.B. Amici, W. Hofmeister, E. Strasburger, S.G. Nawaschin, P. Maheshwari, B.M. Johri, W.A. Jensen, J. Heslop-Harrison) and scope.	(60 lectures)	Susanta Kumar Maity	
2	Unit 2: Reproductive development :Induction of flowering; flower as a modified determinate shoot. Flower development: genetic and molecular aspects.		Susanta Kumar Maity	
3	Unit 3: Anther and pollen biology Anther wall: Structure and functions, microsporogenesis, callose deposition and its significance. Microgametogenesis; Pollen wall structure, MGU (male germ unit) structure, NPC system; Palynology and scope (a brief account); Pollen wall proteins; Pollen viability, storage and germination; Abnormal features: Pseudomonads, polyads, massulae, pollinia.		Susanta Kumar Maity	
4	Unit 4: Ovule Structure; Types; Special structures–endothelium, obturator, aril, caruncle and hypostase; Female Gametophyte – megasporogenesis (monosporic, bisporic and tetrasporic) and megagametogenesis (details of <i>Polygonum</i> type); Organization and ultrastructure of mature embryo sac.		Susanta Kumar Maity	
5	Unit 5: Pollination and fertilization Pollination types and significance; adaptations; structure of stigma and style; path of pollen tube in pistil; double fertilization.		Susanta Kumar Maity	
6	Unit 6: Self incompatibility Basic concepts (interspecific, intraspecific, homomorphic, heteromorphic, GSI and SSI); Methods to overcome self- incompatibility: mixed pollination, bud pollination, stub pollination; Intra-ovarian and <i>in vitro</i> pollination; Modification of stigma surface, parasexual hybridization; Cybrids, <i>in vitro</i> fertilization.		Susanta Kumar Maity	
7	Unit 7: Embryo, Endosperm and Seed Structure and types; General pattern of development of dicot and monocot embryo and endosperm; Suspensor: structure and functions; Embryo-endosperm relationship; Nutrition of embryo; Unusual features; Embryo development in <i>Paonia</i> . Seed structure, importance and dispersal mechanisms		Susanta Kumar Maity	

8	Units 7: Polyembryony and apomixis Introduction; Classification; Causes and applications.		Susanta Kumar Maity	
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Semester V (AY 2017-2020)		Period: to		
Paper: CC11P (Reproductive Biology of Angiosperms) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Anther: Wall and its ontogeny; Tapetum (amoeboid and glandular); MMC, spore tetrads, uninucleate, bicelled and dehisced anther stages through slides/micrographs, male germ unit (MGU) through photographs and schematic representation.	(40 lectures)	Susanta Kumar Maity	
2	2. Pollen grains: Fresh and acetolyzed showing ornamentation and aperture, pseudomonads, polyads, pollinia (slides/photographs, fresh material), ultrastructure of pollen wall (micrograph); Pollen viability: Tetrazolium test. germination: Calculation of percentage germination in different media using hanging drop method.		Susanta Kumar Maity	
3	3. Ovule: Types-anatropous, orthotropous, amphitropous/campylotropous, circinotropous, unitegmatic, bitegmatic; Tenuinucellate and crassinucellate; Special structures: Endothelium, obturator, hypostase, caruncle and aril (permanent slides/specimens/photographs).		Susanta Kumar Maity	
4	4. Female gametophyte through permanent slides/ photographs: Types, ultrastructure of mature egg apparatus.		Susanta Kumar Maity	
5	5. Intra-ovarian pollination; Test tube pollination through photographs.		Susanta Kumar Maity	
6	6. Endosperm: Dissections of developing seeds for endosperm with free-nuclear haustoria.		Susanta Kumar Maity	
7	7. Embryogenesis: Study of development of dicot embryo through permanent slides; dissection of developing seeds for embryos at various developmental stages; Study of suspensor through electron micrographs		Susanta Kumar Maity	

Semester V (AY 2017-2020)		Period: to		
Paper: CC12T (Plant Physiology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Plant-water relations Water Potential and its components, water absorption by roots,	(60	Dr.Nilay Kumar	

	aquaporins, pathway of water movement, symplast, apoplast, transmembrane pathways, root pressure, guttation. Ascent of sap – cohesion-tension theory. Transpiration and factors affecting transpiration, antitranspirants, mechanism of stomatal movement.	lectures)	Maitra	
2	Unit 2: Mineral nutrition Essential and beneficial elements, macro and micronutrients, methods of study and use of nutrient solutions, criteria for essentiality, mineral deficiency symptoms, roles of essential elements, chelating agents.		Dr.Nilay Kumar Maitra	
3	Unit 3: Nutrient Uptake Soil as a nutrient reservoir, transport of ions across cell membrane, passive absorption, electrochemical gradient, facilitated diffusion, active absorption, role of ATP, carrier systems, proton ATPase pump and ion flux, uniport, co-transport, symport, antiport.		Dr.Nilay Kumar Maitra	
4	Unit 4: Translocation in the phloem Experimental evidence in support of phloem as the site of sugar translocation. Pressure–Flow Model; Phloem loading and unloading; Source–sink relationship.		Dr.Nilay Kumar Maitra	
5	Unit 5: Plant growth regulators Discovery, chemical nature (basic structure), bioassay and physiological roles of Auxin, Gibberellins, Cytokinin, Abscisic acid, Ethylene, Brassinosteroids and Jasmonic acid.		Dr.Nilay Kumar Maitra	
6	Unit 6: Physiology of flowering Photoperiodism, flowering stimulus, florigen concept, vernalization, seed dormancy.		Dr.Nilay Kumar Maitra	
7	Unit 7: Phytochrome , cryptochromes and phototropins Discovery, chemical nature, role in photomorphogenesis, low energy responses (LER) and high irradiance responses (HIR), mode of action.		Dr.Nilay Kumar Maitra	

Semester V (AY 2017-2020)		Period: _____ to _____		
Paper: CC12P (Plant Physiology) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Determination of osmotic potential of plant cell sap by plasmolytic method.	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Determination of water potential of given tissue (potato tuber) by weight method.		Dr.Nilay Kumar Maitra	
3	Study of the effect of wind velocity and light on the rate of transpiration in excised twig/leaf.		Dr.Nilay Kumar Maitra	
4	Calculation of stomatal index and stomatal frequency from the two surfaces of leaves of a mesophyte and xerophyte.		Dr.Nilay Kumar Maitra	
5	To calculate the area of an open stoma and percentage of leaf area open through stomata in a mesophyte and xerophyte (both surfaces).		Dr.Nilay Kumar Maitra	
6	To study the phenomenon of seed germination (effect of light).		Dr.Nilay Kumar Maitra	
7	To study the effect of different concentrations of IAA on <i>Avenacoleoptile</i> elongation (IAA Bioassay).		Dr.Nilay Kumar Maitra	

8	To study the induction of amylase activity in germinating barley grains.		Dr.Nilay Kumar Maitra	
	Demonstration experiments			
	1. To demonstrate suction due to transpiration.		Dr.Nilay Kumar Maitra	
	2. Fruit ripening/Rooting from cuttings (Demonstration).		Dr.Nilay Kumar Maitra	
	3. Bolting experiment/ <i>Avenacoleptile</i> bioassay (demonstration).		Dr.Nilay Kumar Maitra	

Semester V (AY 2017-2020)		Period: to		
Paper: DSE1 (Biostatistics) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biostatistics Definition - statistical methods - basic principles. Variables - measurements, functions, limitations and uses of statistics.	(60 lectures)	Dr.Nilay Kumar Maitra	
2	Unit 2: Collection of data primary and secondary Types and methods of data collection procedures - merits and demerits. Classification - tabulation and presentation of data - sampling methods.		Dr.Nilay Kumar Maitra	
3	Unit 3: Measures of central tendency Mean, median, mode, geometric mean - merits & demerits. Measures of dispersion - range, standard deviation, mean deviation, quartile deviation - merits and demerits; Co-efficient of variations.		Dr.Nilay Kumar Maitra	
4	Unit 4: Correlation Types and methods of correlation, regression, simple regression equation, fitting prediction, similarities and dissimilarities of correlation and regression		Dr.Nilay Kumar Maitra	
5	Unit 5: Statistical inference Hypothesis - simple hypothesis - student 't' test - chi square test.		Dr.Nilay Kumar Maitra	

Semester V (AY 2017-2020)		Period: to		
Paper: DSE 1P (Biostatistics) (Practical)		Full Marks: 20		Credit:02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Calculation of mean, standard deviation and standard error	(40 lectures)	Dr.Nilay Kumar Maitra	
2	Calculation of correlation coefficient values and finding out the probability		Dr.Nilay Kumar	

			Maitra	
3	Calculation of 'F' value and finding out the probability value for the F value.		Dr.Nilay Kumar Maitra	

Semester V (AY 2017-2020)		Period: to		
Paper: DSE2 (Plant Breeding) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Plant Breeding Introduction and objectives. Breeding systems: modes of reproduction in crop plants. Important achievements and undesirable consequences of plant breeding.	(8 lectures)	SkMd Ismail Al Amin	
2	Unit 2: Methods of crop improvement Introduction: Centres of origin and domestication of crop plants, plant genetic resources; Acclimatization; Selection methods: For self pollinated, cross pollinated and vegetatively propagated plants; Hybridization: For self, cross and vegetatively propagated plants – Procedure, advantages and limitations.	(8 lectures)	Susanta Kumar Maity	
3	Unit 3: Quantitative inheritance Concept, mechanism, examples of inheritance of Kernel colour in wheat, Skin colour in human beings. Monogenic vs polygenic Inheritance.	(8 lectures)	SkMd Ismail Al Amin	
4	Unit 4: Inbreeding depression and heterosis History, genetic basis of inbreeding depression and heterosis; Applications.	(8 lectures)	Susanta Kumar Maity	
5	Unit 5: Crop improvement and breeding Role of mutations; Polyploidy; Distant hybridization and role of biotechnology in crop improvement.	(8 lectures)	SkMd Ismail Al Amin	

**Curriculum Plan (EVEN SEMESTER)
(Botany Honours; CBCS)**

Semester VI (AY 2017-2020)		Period: _____ to _____		
Paper: CC13T (Plant Metabolism) (Theory)		Full Marks: _____		Credit: _____
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Concept of metabolism Introduction, anabolic and catabolic pathways, regulation of metabolism, role of regulatory enzymes (allosteric ,covalent modulation and Isozymes).</p> <p>Unit 2: Carbon assimilation Historical background, photosynthetic pigments, role of photosynthetic pigments (chlorophylls and accessory pigments), antenna molecules and reaction centres, photochemical reactions, photosynthetic electron transport, PSI, PSII, Q cycle, CO₂ reduction, photorespiration, C₄ pathways; Crassulacean acid metabolism; Factors affecting CO₂ reduction.</p> <p>Unit 3: Carbohydrate metabolism Synthesis and catabolism of sucrose and starch.</p> <p>Unit 4: Carbon Oxidation Glycolysis, fate of pyruvate, regulation of glycolysis, oxidative pentose phosphate pathway, oxidative decarboxylation of pyruvate, regulation of PDH, NADH shuttle; TCA cycle,amphibolic role, anaplerotic reactions, regulation of the cycle, mitochondrial electron transport, oxidative phosphorylation, cyanide-resistant respiration, factors affecting respiration.</p> <p>Unit 5: ATP-Synthesis Mechanism of ATP synthesis, substrate level phosphorylation, chemiosmotic mechanism (oxidative and photophosphorylation), ATP synthase, Boyers conformational model, Racker’s experiment, Jagendorf’s experiment; role of uncouplers.</p> <p>Unit 6: Lipid metabolism Synthesis and breakdown of triglycerides, β-oxidation, glyoxylate cycle, gluconeogenesis and its role in mobilisation of lipids during seed germination, α oxidation</p> <p>Unit 7: Nitrogen metabolism Nitrate assimilation, biological nitrogen fixation (examples of legumes and non-legumes); Physiology and biochemistry of nitrogen fixation; Ammonia assimilation and transamination.</p> <p>Unit 8: Mechanisms of signal transduction Receptor-ligand interactions; Second messenger concept, Calcium calmodulin, MAP kinase cascade</p>	(60 lectures)	Dr.Nilay Kumar Maitra	

Semester VI (AY 2017-2020)		Period: to		
Paper: CC13P Plant Metabolism (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Chemical separation of photosynthetic pigments.</p> <p>2. Experimental demonstration of Hill's reaction.</p> <p>3. To study the effect of light intensity on the rate of photosynthesis.</p> <p>4. Effect of carbon dioxide on the rate of photosynthesis.</p> <p>5. To compare the rate of respiration in different parts of a plant.</p> <p>6. To demonstrate activity of Nitrate reductase in germinating leaves of different plant sources.</p> <p>7. To study the activity of lipases in germinating oilseeds and demonstrate mobilization of lipids 1. during germination.</p> <p>8. Demonstration of fluorescence by isolated chlorophyll pigments.</p> <p>9. Demonstration of absorption spectrum of photosynthetic pigments</p>	(35 lectures)	Dr.Nilay Kumar Maitra	

Semester VI (AY 2017-2020)		Period: to		
Paper: CC14T (Plant Biotechnology) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit -1: Plant Tissue Culture Historical perspective; Composition of media; Nutrient and hormone requirements (role of vitamins and hormones); Totipotency; Organogenesis; Embryogenesis (somatic and zygotic); Protoplast isolation, culture and fusion; Tissue culture applications (micropropagation, androgenesis, virus elimination, secondary metabolite production, haploids, triploids and hybrids; Cryopreservation; Germplasm Conservation).</p> <p>Unit- 2: Recombinant DNA technology Restriction Endonucleases (History, Types I-IV, biological role and application);</p> <p>Unit - 5: Applications of Biotechnology Pest resistant (Bt-cotton); herbicide resistant plants (RoundUp Ready soybean); Transgenic crops with improved</p>	(30 lectures)	Susanta Kumar Maity	

	quality traits (Flavr Savr tomato, Golden rice); Improved horticultural varieties (Moondust carnations); Role of transgenics in bioremediation (Superbug); edible vaccines; Industrial enzymes (Aspergillase, Protease, Lipase); Genetically Engineered Products–Human Growth Hormone; Humulin; Biosafety concerns.			
2	Unit- 2: Restriction Mapping (Linear and Circular); Cloning Vectors: Prokaryotic (pUC 18 and pUC19, pBR322, Ti plasmid, BAC); Lambda phage, M13 phagemid, Cosmid, Shuttle vector; Eukaryotic Vectors (YAC). Unit- 3: Gene Cloning Recombinant DNA, Bacterial Transformation and selection of recombinant clones, PCR mediated gene cloning; Gene Construct; construction of genomic and cDNA libraries, screening DNA libraries to obtain gene of interest by genetic selection; complementation, colony hybridization; PCR Unit- 4: Methods of gene transfer Agrobacterium-mediated, Direct gene transfer by Electroporation, Microinjection, Microprojectile bombardment; Selection of transgenics– selectable marker and reporter genes (Luciferase, GUS, GFP).	(30 lectures)	SkMd Ismail Al Amin	

Semester V (AY 2017-2020)		Period: _____ to _____		
Paper: CC14P (_____) (Practical)		Full Marks: _____ Credit: _____		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. (a) Preparation of MS medium. (b) Demonstration of in vitro sterilization and inoculation methods using leaf and nodal explants of tobacco, Datura, Brassica etc. 2. Study of anther, embryo and endosperm culture, micropropagation, somatic embryogenesis & artificial seeds through photographs. 3. Isolation of protoplasts.	(16 lectures)	Susanta Kumar Maity	
2	4. Construction of restriction map of circular and linear DNA from the data provided. 5. Study of methods of gene transfer through photographs: Agrobacterium-mediated, direct gene 6. transfer by electroporation, microinjection, microprojectile bombardment. 7. Study of steps of genetic engineering for production of Bt cotton, Golden rice, Flavr Savr tomato through photographs. 8. Isolation of plasmid DNA. 9. Restriction digestion and gel electrophoresis of plasmid DNA.	(16 lectures)	SkMd Ismail Al Amin	

Semester VI (AY 2017-2020)		Period: _____ to _____		
Paper: DSE3 (Industrial and Environmental		Full Marks: _____ Credit: _____		

Microbiology) (Theory)				
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Scope of microbes in industry and environment</p> <p>Unit 2: Bioreactors/Fermenters and fermentation processes Solid-state and liquid-state (stationary and submerged) fermentations; Batch and continuous fermentations. Components of a typical bioreactor, Types of bioreactors laboratory, pilotscale and production fermenters; Constantly stirred tank fermenter, tower fermenter, fixed bed and fluidized bed bioreactors and air-lift fermenter. A visit to any educational institute/ industry to see an industrial fermenter, and other downstream processing operations.</p> <p>Unit 3: Microbial production of industrial products Microorganisms involved, media, fermentation conditions, downstream processing and uses; Filtration, centrifugation, cell disruption, solvent extraction, precipitation and ultrafiltration, lyophilization, spray drying; Hands on microbial fermentations for the production and estimation (qualitative and quantitative) of Enzyme: amylase or lipase activity, Organic acid (citric acid or glutamic acid), alcohol (Ethanol) and antibiotic (Penicillin)</p> <p>Unit 4: Microbial enzymes of industrial interest and enzyme immobilization Microorganisms for industrial applications and hands on screening microorganisms for casein hydrolysis; starch hydrolysis; cellulose hydrolysis. Methods of immobilization, advantages and applications of immobilization, large scale applications of immobilized enzymes (glucose isomerase and penicillin acylase).</p> <p>Unit 5: Microbes and quality of environment. Distribution of microbes in air; Isolation of microorganisms from soil, air and water.</p> <p>Unit 6: Microbial flora of water. Water pollution, role of microbes in sewage and domestic waste water treatment systems. Determination of BOD, COD, TDS and TOC of water samples; Microorganisms as indicators of water quality, check coliform and fecal coliform in water samples.</p> <p>Unit 7: Microbes in agriculture and remediation of contaminated soils. Biological fixation; Mycorrhizae; Bioremediation of contaminated soils. Isolation of root nodulating bacteria, arbuscular mycorrhizal colonization in plant roots.</p>	(50 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2017-2020)		Period: to		
Paper: DSE3 (Industrial and Environmental Microbiology) (Practical)		Full Marks: Credit:		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Principles and functioning of instruments in microbiology laboratory</p> <p>2. Hands on sterilization techniques and preparation of culture media.</p>	(30 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2017-2020)		Period: to		
Paper: DSE4 (Analytical Techniques in Plant Sciences) (Theory)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit- 1: Imaging and related techniques Principles of microscopy; Light microscopy; Fluorescence microscopy; Confocal microscopy; Use of fluorochromes: (a) Flow cytometry (FACS); (b) Applications of fluorescence microscopy: Chromosome banding, FISH, chromosome painting; Transmission and Scanning electron microscopy – sample preparation for electron microscopy, cryofixation, negative staining, shadow casting, freeze fracture, freeze etching.</p> <p>Unit- 2: Cell fractionation Centrifugation: Differential and density gradient centrifugation, sucrose density gradient, CsCl₂ gradient, analytical centrifugation, ultracentrifugation, marker enzymes.</p> <p>Unit- 3: Radioisotopes Use in biological research, autoradiography, pulse chase experiment.</p> <p>Unit- 4: Spectrophotometry Principle and its application in biological research.</p> <p>Unit- 5: Chromatography Principle; Paper chromatography; Column chromatography, TLC, GLC, HPLC, Ionexchange chromatography; Molecular sieve chromatography; Affinity chromatography.</p> <p>Unit- 6: Characterization of proteins and nucleic acids Mass spectrometry; X-ray diffraction; X-ray crystallography; Characterization of proteins and nucleic acids; Electrophoresis: AGE, PAGE, SDS-PAGE</p> <p>Unit- 7: Biostatistics Statistics, data, population, samples, parameters; Representation of Data: Tabular, Graphical; Measures of central tendency: Arithmetic mean, mode, median; Measures of dispersion: Range, mean deviation, variation, standard deviation; Chi-square test for goodness of fit.</p>	(50 lectures)	SkMd Ismail Al Amin & Susanta Kumar Maity	

Semester VI (AY 2017-2020)		Period: to		
Paper: DSE4 (Analytical Techniques in Plant Sciences) (Practical)		Full Marks:		Credit:
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Study of Blotting techniques: Southern, Northern and Western, DNA	(30)	SkMd Ismail Al	

	<p>fingerprinting, DNA sequencing, PCR through photographs.</p> <p>2. Demonstration of ELISA.</p> <p>3. To separate nitrogenous bases by paper chromatography.</p> <p>4. To separate sugars by thin layer chromatography.</p> <p>5. Isolation of chloroplasts by differential centrifugation.</p> <p>6. To separate chloroplast pigments by column chromatography.</p> <p>7. To estimate protein concentration through Lowry's methods. 8. To separate proteins using PAGE.</p> <p>9. To separation DNA (marker) using AGE.</p> <p>10. Study of different microscopic techniques using photographs/micrographs (freeze fracture, freeze etching, negative staining, positive staining, fluorescence and FISH).</p> <p>11. Preparation of permanent slides (double staining)</p>	lectures)	Amin & Susanta Kumar Maity	
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**Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)**

Semester I (AY 2021-2023)		Period: _____ to _____		
Paper: GE1T (Biodiversity (Microbes, Algae, Fungi and Archegoniate)) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Microbes Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.	(12 lectures)	Sk Md Ismail Al Amin	
2	Unit 2: Algae General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: <i>Nostoc</i> , <i>Chlamydomonas</i> , <i>Oedogonium</i> , <i>Vaucheria</i> , <i>Fucus</i> , <i>Polysiphonia</i> . Economic importance of algae.	(10 lectures)	Susanta Kumar Maity	
3	Unit 3: Fungi Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of <i>Rhizopus</i> (Zygomycota) <i>Penicillium</i> , <i>Alternaria</i> (Ascomycota), <i>Puccinia</i> , <i>Agaricus</i> (Basidiomycota); Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.	(10 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Introduction to Archegoniate Unifying features of archegoniates, Transition to land habit, Alternation of generations.	(10 lectures)	Sk Md Ismail Al Amin	
5	Unit 5: Bryophytes General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of <i>Marchantia</i> and <i>Funaria</i> . (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of <i>Sphagnum</i> .			
6	Unit 6: Pteridophytes General characteristics, classification, Early land plants (<i>Cooksonia</i> and <i>Rhynia</i>). Classification (up to family), morphology, anatomy and reproduction of <i>Selaginella</i> , <i>Equisetum</i> and <i>Pteris</i> . (Developmental details not to be included). Heterospory and seed habit, stellar evolution. Ecological and economical importance of Pteridophytes.	(10 lectures)	Susanta Kumar Maity	
7	Unit 7: Gymnosperms General characteristics; Classification (up to family), morphology, anatomy and reproduction of <i>Cycas</i> and <i>Pinus</i> (Developmental details not to be included). Ecological and economical importance.	(4 lectures)	Susanta Kumar Maity	

Semester I (AY 2021-2023)		Period: _____ to _____		
Paper: GE1P (Biodiversity (Microbes, Algae, Fungi and Archegoniate)) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle. 2. Types of Bacteria from temporary/permanent slides/ photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule. 3. Gram staining	(4 lectures)	Sk Md Ismail Al Amin	
2	3. Study of vegetative and reproductive structures of <i>Nostoc</i> , <i>Chlamydomonas</i> (electron micrographs), <i>Oedogonium</i> , <i>Vaucheria</i> , <i>Fucus</i> * and <i>Polysiphonia</i> through temporary preparations and permanent slides. (* <i>Fucus</i> - Specimen and permanent slides)	(6 lectures)	Susanta Kumar Maity	
3	4. <i>Rhizopus</i> and <i>Penicillium</i> : Asexual stage from temporary mounts and sexual Structures through permanent slides. 5. <i>Alternaria</i> : Specimens/photographs and tease mounts. 6. <i>Puccinia</i> : Herbarium specimens of Black Stem Rust of Wheat and infected Barberryleaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts. 7. <i>Agaricus</i> : Specimens of button stage and full grown mushroom; Sectioning of gills of <i>Agaricus</i> . 8. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) 9. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)	(6 lectures)	Dr. Nilay Kumar Maitra	
4	10. <i>Marchantia</i> - morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemmacup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides). 11. <i>Funaria</i> - morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores(temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.	(4 lectures)	Sk Md Ismail Al Amin	
	12. <i>Selaginella</i> - morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide). 14. <i>Equisetum</i> - morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry)(temporary slides); t.s rhizome (permanent slide). 13. <i>Pteris</i> - morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores(temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide). 14. <i>Cycas</i> - morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide). 15. <i>Pinus</i> - morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, , l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. & r.l.s. stem (permanent slide).	(6 lectures)	Susanta Kumar Maity	

**Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)**

Semester II (AY 2021-2023)		Period:	to	
Paper: GE2T (Plant Ecology and Taxonomy) (Theory)		Full Marks: 40	Credit: 04	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit- 1: Introduction Unit- 2: Ecological factors Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes	(4 lectures)	Dr. Nilay Kumar Maitra	
2	Unit -3: Plant communities Characters; Ecotone and edge effect; Succession; Processes and types	(2 lectures)	Dr. Nilay Kumar Maitra	
3	Unit- 4: Ecosystem Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Bio-geochemical cycling; Cycling of carbon, nitrogen and Phosphorous	(4 lectures)	Dr. Nilay Kumar Maitra	
4	Unit- 5: Phyto geography Principle of Biogeographical zone; Endemism.	(2 lectures)	Dr. Nilay Kumar Maitra	
5	Unit- 6: Introduction to plant taxonomy Identification, Classification, Nomenclature.	(2 lectures)	Susanta Kumar Maity	
6	Unit- 7 : Identification Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access	(2 lectures)	Susanta Kumar Maity	
7	Unit 8 : Taxonomic evidences from palynology, cytology, phytochemistry and molecular data.	(2 lectures)	Susanta Kumar Maity	
8	Unit 9 : Taxonomic hierarchy Ranks, categories and taxonomic groups	(2 lectures)	Susanta Kumar Maity	
9	Unit 10: Botanical nomenclature Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.	(4 lectures)	Susanta Kumar Maity	
10	Unit 11: Classification Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).	(2 lectures)	Susanta Kumar Maity	
	Unit 12: Biometrics, numerical taxonomy and cladistics Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences).	(2 lectures)	Susanta Kumar Maity	

Semester II (AY 2021-2023)		Period: _____ to _____		
Paper: GE2P (Plant Ecology and Taxonomy) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	(2 lectures)	Dr. Nilay Kumar Maitra	
2	2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.	(3 lectures)	Dr. Nilay Kumar Maitra	
3	3. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.	(3 lectures)	Dr. Nilay Kumar Maitra	
4	4. (a) Study of morphological adaptations of hydrophytes and xerophytes (four each). (b) Study of biotic interactions of the following: Stem parasite (<i>Cuscuta</i>), Root parasite (<i>Orobancha</i>), Epiphytes, Predation (Insectivorous plants)	(4 lectures)	Susanta Kumar Maity	
	5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)	(2 lectures)	Dr. Nilay Kumar Maitra	
	6. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law	(2 lectures)	Dr. Nilay Kumar Maitra	
	7. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Brassicaceae - <i>Brassica</i> , <i>Alyssum</i> / <i>Iberis</i> ; Asteraceae - <i>Sonchus</i> / <i>Launaea</i> , <i>Vernonia</i> / <i>Ageratum</i> , <i>Eclipta</i> / <i>Tridax</i> ; Solanaceae - <i>Solanum nigrum</i> , <i>Withania</i> ; Lamiaceae - <i>Salvia</i> , <i>Ocimum</i> ; Liliaceae - <i>Asphodelus</i> / <i>Lilium</i> / <i>Allium</i> .	(8 lectures)	Susanta Kumar Maity	
	8. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).	(4 lectures)	Sk Md Ismail Al Amin	

**Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)**

Semester III (AY 2021-2023)		Period:	to		
Paper: GE3T (Economic Botany and Plant Biotechnology) (Theory)		Full Marks: 40	Credit: 04		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	Unit 1: Origin of Cultivated Plants: Concept of centres of origin, their importance with reference to Vavilov's work.	(4 lectures)	Dr. Nilay Kumar Maitra		
2	Unit 2: Cereals: Wheat -Origin, morphology, uses	(2 lectures)	Dr. Nilay Kumar Maitra		
3	Unit 3: Legumes: General account with special reference to Gram and soybean	(2 lectures)	Dr. Nilay Kumar Maitra		
4	Unit 4: Spices: General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
5	Unit 5: Beverages :Tea (morphology, processing, uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
6	Unit 6: Oils and Fats: General description with special reference to groundnut	(2 lectures)	Dr. Nilay Kumar Maitra		
7	Unit 7: Fibre Yielding Plants: General description with special reference to Cotton (Botanical name, family, part used, morphology and uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
8	Unit 8: Introduction to biotechnology	(2 lectures)	Susanta Kumar Maity		
9	Unit 9: Plant tissue culture: Micropropagation ; haploid production through androgenesis and gynogenesis; brief account of embryo and endosperm culture with their applications.	(8 lectures)	Susanta Kumar Maity		
10	Unit 10: Recombinant DNA Techniques Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. Hybridoma and monoclonal antibodies, ELISA and Immuno detection. Molecular diagnosis of human disease, Human gene Therapy	(10 lectures)	Sk Md Ismail Al Amin		

Semester III (AY 2021-2023)		Period:	to		
Paper: GE3P (Economic Botany and Plant Biotechnology) (Practical)		Full Marks: 20	Credit:02		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	1. Study of economically important plants : Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and micro chemical tests	(6 lectures)	Dr. Nilay Kumar Maitra		
2	2. Familiarization with basic equipments in tissue culture.	(2 lectures)	Susanta Kumar Maity		
3	3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.	(2 lectures)	Susanta Kumar Maity		
4	4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.	(4 lectures)	Sk Md Ismail Al Amin		

Semester III (AY 2021-2023)		Period: _____ to _____		
Paper: SEC1T (Biofertilizers) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit- 1: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.</p> <p>Unit- 2: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.</p> <p>Unit- 3: Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.</p> <p>Unit- 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.</p> <p>Unit-5: Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.</p>	(40 lectures)	Dr.Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany GENERAL; CBCS)**

Semester IV (AY 2021-2023)		Period: _____ to _____		
Paper: GE4T (Plant Anatomy and Embryology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Meristematic and permanent tissues Root and shoot apical meristems; Simple and complex tissues	(2 lectures)	Susanta Kumar Maity	
2	Unit 2: Organs Structure of dicot and monocot root stem and leaf.	(4 lectures)	Susanta Kumar Maity	
3	Unit 3: Secondary Growth Vascular cambium – structure and function, seasonal activity. Secondary growth in root and stem, Wood (heartwood and sapwood)	(4 lectures)	Susanta Kumar Maity	
4	Unit 4: Adaptive and protective systems Epidermis, cuticle, stomata; General account of adaptations in xerophytes and hydrophytes.	(4 lectures)	Susanta Kumar Maity	
5	Unit 5: Structural organization of flower Structure of anther and pollen; Structure and types of ovules; Types of embryo sacs, organization and ultrastructure of mature embryo sac.	(4 lectures)	Susanta Kumar Maity	
6	Unit 6: Pollination and fertilization Pollination mechanisms and adaptations; Double fertilization; Seed-structure appendages and dispersal mechanisms.	(4 lectures)	Susanta Kumar Maity	
7	Unit 7: Embryo and endosperm Endosperm types, structure and functions; Dicot and monocot embryo; Embryo endosperm relationship	(4 lectures)	Susanta Kumar Maity	
	Unit 8: Apomixis and polyembryony Definition, types and Practical applications	(4 lectures)	Susanta Kumar Maity	

Semester IV (AY 2021-2023)		Period: to		
Paper: GE4P (Plant Anatomy and Embryology) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of meristems through permanent slides and photographs.	(1 lectures)	Susanta Kumar Maity	
2	2. Tissues (parenchyma, collenchyma and sclerenchyma); Macerated xylary elements, Phloem (Permanent slides, photographs)	(1 lectures)	Susanta Kumar Maity	
3	3. Stem: Monocot: <i>Zea mays</i> ; Dicot: <i>Helianthus</i> ; Secondary: <i>Helianthus</i> (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
4	4. Root: Monocot: <i>Zea mays</i> ; Dicot: <i>Helianthus</i> ; Secondary: <i>Helianthus</i> (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
5	5. Leaf: Dicot and Monocot leaf (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
6	6. Adaptive anatomy: Xerophyte (<i>Nerium</i> leaf); Hydrophyte (<i>Hydrilla</i> stem).	(2 lectures)	Susanta Kumar Maity	
7	7. Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides).	(1 lectures)	Susanta Kumar Maity	
8	8. Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/ campylotropous.	(1 lectures)	Susanta Kumar Maity	
9	9. Female gametophyte: <i>Polygonum</i> (monosporic) type of Embryo sac Development (Permanent slides/photographs).	(1 lectures)	Susanta Kumar Maity	
10	10. Ultrastructure of mature egg apparatus cells through electron micrographs.	(1 lectures)	Susanta Kumar Maity	
11	11. Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).	(1 lectures)	Susanta Kumar Maity	
12	12. Dissection of embryo/endosperm from developing seeds.	(1 lectures)	Susanta Kumar Maity	
13	13. Calculation of percentage of germinated pollen in a given medium.	(1 lectures)	Susanta Kumar Maity	

Semester IV (AY 2021-2023)		Period: to		
Paper: SEC2T (Mushroom Culture Technology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India - <i>Volvariella volvacea</i> , <i>Pleurotus citrinopileatus</i> , <i>Agaricus bisporus</i> .		Dr. Nilay Kumar Maitra	

2	Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.		Dr.Nilay Kumar Maitra	
3	Unit 3: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.		Dr.Nilay Kumar Maitra	
4	Unit 4: Food Preparation:Types of foods prepared from mushroom.Research Centres - National level and Regional level.Cost benefit ratio - Marketing in India and abroad, Export Value.		Dr.Nilay Kumar Maitra	

**Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)**

Semester I (AY 2020-2022)		Period: _____ to _____		
Paper: GE1T (Biodiversity (Microbes, Algae, Fungi and Archegoniate)) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Microbes Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.	(12 lectures)	Sk Md Ismail Al Amin	
2	Unit 2: Algae General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: <i>Nostoc</i> , <i>Chlamydomonas</i> , <i>Oedogonium</i> , <i>Vaucheria</i> , <i>Fucus</i> , <i>Polysiphonia</i> . Economic importance of algae.	(10 lectures)	Susanta Kumar Maity	
3	Unit 3: Fungi Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of <i>Rhizopus</i> (Zygomycota) <i>Penicillium</i> , <i>Alternaria</i> (Ascomycota), <i>Puccinia</i> , <i>Agaricus</i> (Basidiomycota); Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.	(10 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Introduction to Archegoniate Unifying features of archegoniates, Transition to land habit, Alternation of generations.	(10 lectures)	Sk Md Ismail Al Amin	
5	Unit 5: Bryophytes General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of <i>Marchantia</i> and <i>Funaria</i> . (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of <i>Sphagnum</i> .			
6	Unit 6: Pteridophytes General characteristics, classification, Early land plants (<i>Cooksonia</i> and <i>Rhynia</i>). Classification (up to family), morphology, anatomy and reproduction of <i>Selaginella</i> , <i>Equisetum</i> and <i>Pteris</i> . (Developmental details not to be included). Heterospory and seed habit, stellar evolution. Ecological and economical importance of Pteridophytes.	(10 lectures)	Susanta Kumar Maity	
7	Unit 7: Gymnosperms General characteristics; Classification (up to family), morphology, anatomy and reproduction of <i>Cycas</i> and <i>Pinus</i> (Developmental details not to be included). Ecological and economical importance.	(4 lectures)	Susanta Kumar Maity	

Semester I (AY 2020-2022)		Period: _____ to _____		
Paper: GE1P (Biodiversity (Microbes, Algae, Fungi and Archegoniate)) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle. 2. Types of Bacteria from temporary/permanent slides/ photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule. 3. Gram staining	(4 lectures)	Sk Md Ismail Al Amin	
2	3. Study of vegetative and reproductive structures of <i>Nostoc</i> , <i>Chlamydomonas</i> (electron micrographs), <i>Oedogonium</i> , <i>Vaucheria</i> , <i>Fucus</i> * and <i>Polysiphonia</i> through temporary preparations and permanent slides. (* <i>Fucus</i> - Specimen and permanent slides)	(6 lectures)	Susanta Kumar Maity	
3	4. <i>Rhizopus</i> and <i>Penicillium</i> : Asexual stage from temporary mounts and sexual Structures through permanent slides. 5. <i>Alternaria</i> : Specimens/photographs and tease mounts. 6. <i>Puccinia</i> : Herbarium specimens of Black Stem Rust of Wheat and infected Barberryleaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts. 7. <i>Agaricus</i> : Specimens of button stage and full grown mushroom; Sectioning of gills of <i>Agaricus</i> . 8. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) 9. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)	(6 lectures)	Dr. Nilay Kumar Maitra	
4	10. <i>Marchantia</i> - morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemmacup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides). 11. <i>Funaria</i> - morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores(temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.	(4 lectures)	Sk Md Ismail Al Amin	
	12. <i>Selaginella</i> - morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide). 14. <i>Equisetum</i> - morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry)(temporary slides); t.s. rhizome (permanent slide). 13. <i>Pteris</i> - morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores(temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide). 14. <i>Cycas</i> - morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide). 15. <i>Pinus</i> - morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, , l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. & r.l.s. stem (permanent slide).	(6 lectures)	Susanta Kumar Maity	

**Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)**

Semester II (AY 2020-2022)		Period: to		
Paper: GE2T (Plant Ecology and Taxonomy) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit- 1: Introduction Unit- 2: Ecological factors Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes	(4 lectures)	Dr. Nilay Kumar Maitra	
2	Unit -3: Plant communities Characters; Ecotone and edge effect; Succession; Processes and types	(2 lectures)	Dr. Nilay Kumar Maitra	
3	Unit- 4: Ecosystem Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Bio-geochemical cycling; Cycling of carbon, nitrogen and Phosphorous	(4 lectures)	Dr. Nilay Kumar Maitra	
4	Unit- 5: Phyto geography Principle of Biogeographical zone; Endemism.	(2 lectures)	Dr. Nilay Kumar Maitra	
5	Unit- 6: Introduction to plant taxonomy Identification, Classification, Nomenclature.	(2 lectures)	Susanta Kumar Maity	
6	Unit- 7 : Identification Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access	(2 lectures)	Susanta Kumar Maity	
7	Unit 8 : Taxonomic evidences from palynology, cytology, phytochemistry and molecular data.	(2 lectures)	Susanta Kumar Maity	
8	Unit 9 : Taxonomic hierarchy Ranks, categories and taxonomic groups	(2 lectures)	Susanta Kumar Maity	
9	Unit 10: Botanical nomenclature Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.	(4 lectures)	Susanta Kumar Maity	
10	Unit 11: Classification Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).	(2 lectures)	Susanta Kumar Maity	
	Unit 12: Biometrics, numerical taxonomy and cladistics Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences).	(2 lectures)	Susanta Kumar Maity	

Semester II (AY 2020-2022)		Period: _____ to _____		
Paper: GE2P (Plant Ecology and Taxonomy) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	(2 lectures)	Dr. Nilay Kumar Maitra	
2	2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.	(3 lectures)	Dr. Nilay Kumar Maitra	
3	3. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.	(3 lectures)	Dr. Nilay Kumar Maitra	
4	4. (a) Study of morphological adaptations of hydrophytes and xerophytes (four each). (b) Study of biotic interactions of the following: Stem parasite (<i>Cuscuta</i>), Root parasite (<i>Orobancha</i>), Epiphytes, Predation (Insectivorous plants)	(4 lectures)	Susanta Kumar Maity	
	5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)	(2 lectures)	Dr. Nilay Kumar Maitra	
	6. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law	(2 lectures)	Dr. Nilay Kumar Maitra	
	7. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Brassicaceae - <i>Brassica</i> , <i>Alyssum</i> / <i>Iberis</i> ; Asteraceae - <i>Sonchus</i> / <i>Launaea</i> , <i>Vernonia</i> / <i>Ageratum</i> , <i>Eclipta</i> / <i>Tridax</i> ; Solanaceae - <i>Solanum nigrum</i> , <i>Withania</i> ; Lamiaceae - <i>Salvia</i> , <i>Ocimum</i> ; Liliaceae - <i>Asphodelus</i> / <i>Lilium</i> / <i>Allium</i> .	(8 lectures)	Susanta Kumar Maity	
	8. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).	(4 lectures)	Sk Md Ismail Al Amin	

**Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)**

Semester III (AY 2020-2022)		Period:	to		
Paper: GE3T (Economic Botany and Plant Biotechnology) (Theory)		Full Marks: 40	Credit: 04		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	Unit 1: Origin of Cultivated Plants: Concept of centres of origin, their importance with reference to Vavilov's work.	(4 lectures)	Dr. Nilay Kumar Maitra		
2	Unit 2: Cereals: Wheat -Origin, morphology, uses	(2 lectures)	Dr. Nilay Kumar Maitra		
3	Unit 3: Legumes: General account with special reference to Gram and soybean	(2 lectures)	Dr. Nilay Kumar Maitra		
4	Unit 4: Spices: General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
5	Unit 5: Beverages :Tea (morphology, processing, uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
6	Unit 6: Oils and Fats: General description with special reference to groundnut	(2 lectures)	Dr. Nilay Kumar Maitra		
7	Unit 7: Fibre Yielding Plants: General description with special reference to Cotton (Botanical name, family, part used, morphology and uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
8	Unit 8: Introduction to biotechnology	(2 lectures)	Susanta Kumar Maity		
9	Unit 9: Plant tissue culture: Micropropagation ; haploid production through androgenesis and gynogenesis; brief account of embryo and endosperm culture with their applications.	(8 lectures)	Susanta Kumar Maity		
10	Unit 10: Recombinant DNA Techniques Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. Hybridoma and monoclonal antibodies, ELISA and Immuno detection. Molecular diagnosis of human disease, Human gene Therapy	(10 lectures)	Sk Md Ismail Al Amin		

Semester III (AY 2020-2022)		Period:	to		
Paper: GE3P (Economic Botany and Plant Biotechnology) (Practical)		Full Marks: 20	Credit:02		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	1. Study of economically important plants : Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and micro chemical tests	(6 lectures)	Dr. Nilay Kumar Maitra		
2	2. Familiarization with basic equipments in tissue culture.	(2 lectures)	Susanta Kumar Maity		
3	3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.	(2 lectures)	Susanta Kumar Maity		
4	4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.	(4 lectures)	Sk Md Ismail Al Amin		

Semester III (AY 2020-2022)		Period: _____ to _____		
Paper: SEC1T (Biofertilizers) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit- 1: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.</p> <p>Unit- 2: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.</p> <p>Unit- 3: Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.</p> <p>Unit- 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.</p> <p>Unit-5: Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.</p>	(40 lectures)	Dr.Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany GENERAL; CBCS)**

Semester IV (AY 2020-2022)		Period: _____ to _____		
Paper: GE4T (Plant Anatomy and Embryology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Meristematic and permanent tissues Root and shoot apical meristems; Simple and complex tissues	(2 lectures)	Susanta Kumar Maity	
2	Unit 2: Organs Structure of dicot and monocot root stem and leaf.	(4 lectures)	Susanta Kumar Maity	
3	Unit 3: Secondary Growth Vascular cambium – structure and function, seasonal activity. Secondary growth in root and stem, Wood (heartwood and sapwood)	(4 lectures)	Susanta Kumar Maity	
4	Unit 4: Adaptive and protective systems Epidermis, cuticle, stomata; General account of adaptations in xerophytes and hydrophytes.	(4 lectures)	Susanta Kumar Maity	
5	Unit 5: Structural organization of flower Structure of anther and pollen; Structure and types of ovules; Types of embryo sacs, organization and ultrastructure of mature embryo sac.	(4 lectures)	Susanta Kumar Maity	
6	Unit 6: Pollination and fertilization Pollination mechanisms and adaptations; Double fertilization; Seed-structure appendages and dispersal mechanisms.	(4 lectures)	Susanta Kumar Maity	
7	Unit 7: Embryo and endosperm Endosperm types, structure and functions; Dicot and monocot embryo; Embryo endosperm relationship	(4 lectures)	Susanta Kumar Maity	
	Unit 8: Apomixis and polyembryony Definition, types and Practical applications	(4 lectures)	Susanta Kumar Maity	

Semester IV (AY 2020-2022)		Period: to		
Paper: GE4P (Plant Anatomy and Embryology) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of meristems through permanent slides and photographs.	(1 lectures)	Susanta Kumar Maity	
2	2. Tissues (parenchyma, collenchyma and sclerenchyma); Macerated xylary elements, Phloem (Permanent slides, photographs)	(1 lectures)	Susanta Kumar Maity	
3	3. Stem: Monocot: <i>Zea mays</i> ; Dicot: <i>Helianthus</i> ; Secondary: <i>Helianthus</i> (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
4	4. Root: Monocot: <i>Zea mays</i> ; Dicot: <i>Helianthus</i> ; Secondary: <i>Helianthus</i> (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
5	5. Leaf: Dicot and Monocot leaf (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
6	6. Adaptive anatomy: Xerophyte (<i>Nerium</i> leaf); Hydrophyte (<i>Hydrilla</i> stem).	(2 lectures)	Susanta Kumar Maity	
7	7. Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides).	(1 lectures)	Susanta Kumar Maity	
8	8. Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/ campylotropous.	(1 lectures)	Susanta Kumar Maity	
9	9. Female gametophyte: <i>Polygonum</i> (monosporic) type of Embryo sac Development (Permanent slides/photographs).	(1 lectures)	Susanta Kumar Maity	
10	10. Ultrastructure of mature egg apparatus cells through electron micrographs.	(1 lectures)	Susanta Kumar Maity	
11	11. Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).	(1 lectures)	Susanta Kumar Maity	
12	12. Dissection of embryo/endosperm from developing seeds.	(1 lectures)	Susanta Kumar Maity	
13	13. Calculation of percentage of germinated pollen in a given medium.	(1 lectures)	Susanta Kumar Maity	

Semester IV (AY 2020-2022)		Period: to		
Paper: SEC2T (Mushroom Culture Technology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India - <i>Volvariellavolvacea</i> , <i>Pleurotuscitrinopileatus</i> , <i>Agaricusbisporus</i> .		Dr.Nilay Kumar Maitra	
2	Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop,		Dr.Nilay Kumar Maitra	

	low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.			
3	Unit 3: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.		Dr.Nilay Kumar Maitra	
4	Unit 4: Food Preparation:Types of foods prepared from mushroom.Research Centres - National level and Regional level.Cost benefit ratio - Marketing in India and abroad, Export Value.		Dr.Nilay Kumar Maitra	

Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)

Semester I (AY 2019-2021)		Period: _____ to _____		
Paper: GE1T (Biodiversity (Microbes, Algae, Fungi and Archegoniate)) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Microbes Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.	(12 lectures)	Sk Md Ismail Al Amin	
2	Unit 2: Algae General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: <i>Nostoc</i> , <i>Chlamydomonas</i> , <i>Oedogonium</i> , <i>Vaucheria</i> , <i>Fucus</i> , <i>Polysiphonia</i> . Economic importance of algae.	(10 lectures)	Susanta Kumar Maity	
3	Unit 3: Fungi Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of <i>Rhizopus</i> (Zygomycota) <i>Penicillium</i> , <i>Alternaria</i> (Ascomycota), <i>Puccinia</i> , <i>Agaricus</i> (Basidiomycota); Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.	(10 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Introduction to Archegoniate Unifying features of archegoniates, Transition to land habit, Alternation of generations.	(10 lectures)	Sk Md Ismail Al Amin	
5	Unit 5: Bryophytes General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of <i>Marchantia</i> and <i>Funaria</i> . (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of <i>Sphagnum</i> .			
6	Unit 6: Pteridophytes General characteristics, classification, Early land plants (<i>Cooksonia</i> and <i>Rhynia</i>). Classification (up to family), morphology, anatomy and reproduction of <i>Selaginella</i> , <i>Equisetum</i> and <i>Pteris</i> . (Developmental details not to be included). Heterospory and seed habit, stellar evolution. Ecological and economical importance of Pteridophytes.	(10 lectures)	Susanta Kumar Maity	
7	Unit 7: Gymnosperms General characteristics; Classification (up to family), morphology, anatomy and reproduction of <i>Cycas</i> and <i>Pinus</i> (Developmental details not to be included). Ecological and economical importance.	(4 lectures)	Susanta Kumar Maity	

Semester I (AY 2019-2021)		Period: _____ to _____		
Paper: GE1P (Biodiversity (Microbes, Algae, Fungi and Archegoniate)) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle. 2. Types of Bacteria from temporary/permanent slides/ photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule. 3. Gram staining	(4 lectures)	Sk Md Ismail Al Amin	
2	3. Study of vegetative and reproductive structures of <i>Nostoc</i> , <i>Chlamydomonas</i> (electron micrographs), <i>Oedogonium</i> , <i>Vaucheria</i> , <i>Fucus*</i> and <i>Polysiphonia</i> through temporary preparations and permanent slides. (* <i>Fucus</i> - Specimen and permanent slides)	(6 lectures)	Susanta Kumar Maity	
3	4. <i>Rhizopus</i> and <i>Penicillium</i> : Asexual stage from temporary mounts and sexual Structures through permanent slides. 5. <i>Alternaria</i> : Specimens/photographs and tease mounts. 6. <i>Puccinia</i> : Herbarium specimens of Black Stem Rust of Wheat and infected Barberryleaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts. 7. <i>Agaricus</i> : Specimens of button stage and full grown mushroom; Sectioning of gills of <i>Agaricus</i> . 8. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) 9. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)	(6 lectures)	Dr. Nilay Kumar Maitra	
4	10. <i>Marchantia</i> - morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemmacup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides). 11. <i>Funaria</i> - morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores(temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.	(4 lectures)	Sk Md Ismail Al Amin	
	12. <i>Selaginella</i> - morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide). 14. <i>Equisetum</i> - morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry)(temporary slides); t.s. rhizome (permanent slide). 13. <i>Pteris</i> - morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores(temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide). 14. <i>Cycas</i> - morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide). 15. <i>Pinus</i> - morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, , l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. & r.l.s. stem (permanent slide).	(6 lectures)	Susanta Kumar Maity	

Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)

Semester II (AY 2019-2021)		Period:	to		
Paper: GE2T (Plant Ecology and Taxonomy) (Theory)		Full Marks: 40	Credit: 04		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	Unit- 1: Introduction Unit- 2: Ecological factors Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes	(4 lectures)	Dr. Nilay Kumar Maitra		
2	Unit -3: Plant communities Characters; Ecotone and edge effect; Succession; Processes and types	(2 lectures)	Dr. Nilay Kumar Maitra		
3	Unit- 4: Ecosystem Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Bio-geochemical cycling; Cycling of carbon, nitrogen and Phosphorous	(4 lectures)	Dr. Nilay Kumar Maitra		
4	Unit- 5: Phyto geography Principle of Biogeographical zone; Endemism.	(2 lectures)	Dr. Nilay Kumar Maitra		
5	Unit- 6: Introduction to plant taxonomy Identification, Classification, Nomenclature.	(2 lectures)	Susanta Kumar Maity		
6	Unit- 7 : Identification Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access	(2 lectures)	Susanta Kumar Maity		
7	Unit 8 : Taxonomic evidences from palynology, cytology, phytochemistry and molecular data.	(2 lectures)	Susanta Kumar Maity		
8	Unit 9 : Taxonomic hierarchy Ranks, categories and taxonomic groups	(2 lectures)	Susanta Kumar Maity		
9	Unit 10: Botanical nomenclature Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.	(4 lectures)	Susanta Kumar Maity		
10	Unit 11: Classification Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).	(2 lectures)	Susanta Kumar Maity		
	Unit 12: Biometrics, numerical taxonomy and cladistics Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences).	(2 lectures)	Susanta Kumar Maity		

Semester II (AY 2019-2021)		Period: _____ to _____		
Paper: GE2P (Plant Ecology and Taxonomy) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	(2 lectures)	Dr. Nilay Kumar Maitra	
2	2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.	(3 lectures)	Dr. Nilay Kumar Maitra	
3	3. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.	(3 lectures)	Dr. Nilay Kumar Maitra	
4	4. (a) Study of morphological adaptations of hydrophytes and xerophytes (four each). (b) Study of biotic interactions of the following: Stem parasite (<i>Cuscuta</i>), Root parasite (<i>Orobancha</i>), Epiphytes, Predation (Insectivorous plants)	(4 lectures)	Susanta Kumar Maity	
	5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)	(2 lectures)	Dr. Nilay Kumar Maitra	
	6. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law	(2 lectures)	Dr. Nilay Kumar Maitra	
	7. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Brassicaceae - <i>Brassica</i> , <i>Alyssum</i> / <i>Iberis</i> ; Asteraceae - <i>Sonchus</i> / <i>Launaea</i> , <i>Vernonia</i> / <i>Ageratum</i> , <i>Eclipta</i> / <i>Tridax</i> ; Solanaceae - <i>Solanum nigrum</i> , <i>Withania</i> ; Lamiaceae - <i>Salvia</i> , <i>Ocimum</i> ; Liliaceae - <i>Asphodelus</i> / <i>Lilium</i> / <i>Allium</i> .	(8 lectures)	Susanta Kumar Maity	
	8. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).	(4 lectures)	Sk Md Ismail Al Amin	

**Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)**

Semester III (AY 2019-2021)		Period:	to		
Paper: GE3T (Economic Botany and Plant Biotechnology) (Theory)		Full Marks: 40	Credit: 04		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	Unit 1: Origin of Cultivated Plants: Concept of centres of origin, their importance with reference to Vavilov's work.	(4 lectures)	Dr. Nilay Kumar Maitra		
2	Unit 2: Cereals: Wheat -Origin, morphology, uses	(2 lectures)	Dr. Nilay Kumar Maitra		
3	Unit 3: Legumes: General account with special reference to Gram and soybean	(2 lectures)	Dr. Nilay Kumar Maitra		
4	Unit 4: Spices: General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
5	Unit 5: Beverages :Tea (morphology, processing, uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
6	Unit 6: Oils and Fats: General description with special reference to groundnut	(2 lectures)	Dr. Nilay Kumar Maitra		
7	Unit 7: Fibre Yielding Plants: General description with special reference to Cotton (Botanical name, family, part used, morphology and uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
8	Unit 8: Introduction to biotechnology	(2 lectures)	Susanta Kumar Maity		
9	Unit 9: Plant tissue culture: Micropropagation ; haploid production through androgenesis and gynogenesis; brief account of embryo and endosperm culture with their applications.	(8 lectures)	Susanta Kumar Maity		
10	Unit 10: Recombinant DNA Techniques Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. Hybridoma and monoclonal antibodies, ELISA and Immuno detection. Molecular diagnosis of human disease, Human gene Therapy	(10 lectures)	Sk Md Ismail Al Amin		

Semester III (AY 2019-2021)		Period:	to		
Paper: GE3P (Economic Botany and Plant Biotechnology) (Practical)		Full Marks: 20	Credit:02		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	1. Study of economically important plants : Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and micro chemical tests	(6 lectures)	Dr. Nilay Kumar Maitra		
2	2. Familiarization with basic equipments in tissue culture.	(2 lectures)	Susanta Kumar Maity		
3	3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.	(2 lectures)	Susanta Kumar Maity		
4	4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.	(4 lectures)	Sk Md Ismail Al Amin		

Semester III (AY 2019-2021)		Period: _____ to _____		
Paper: SEC1T (Biofertilizers) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit- 1: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.</p> <p>Unit- 2: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.</p> <p>Unit- 3: Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.</p> <p>Unit- 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.</p> <p>Unit-5: Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.</p>	(40 lectures)	Dr.Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany GENERAL; CBCS)**

Semester IV (AY 2019-2021)		Period: _____ to _____		
Paper: GE4T (Plant Anatomy and Embryology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Meristematic and permanent tissues Root and shoot apical meristems; Simple and complex tissues	(2 lectures)	Susanta Kumar Maity	
2	Unit 2: Organs Structure of dicot and monocot root stem and leaf.	(4 lectures)	Susanta Kumar Maity	
3	Unit 3: Secondary Growth Vascular cambium – structure and function, seasonal activity. Secondary growth in root and stem, Wood (heartwood and sapwood)	(4 lectures)	Susanta Kumar Maity	
4	Unit 4: Adaptive and protective systems Epidermis, cuticle, stomata; General account of adaptations in xerophytes and hydrophytes.	(4 lectures)	Susanta Kumar Maity	
5	Unit 5: Structural organization of flower Structure of anther and pollen; Structure and types of ovules; Types of embryo sacs, organization and ultrastructure of mature embryo sac.	(4 lectures)	Susanta Kumar Maity	
6	Unit 6: Pollination and fertilization Pollination mechanisms and adaptations; Double fertilization; Seed-structure appendages and dispersal mechanisms.	(4 lectures)	Susanta Kumar Maity	
7	Unit 7: Embryo and endosperm Endosperm types, structure and functions; Dicot and monocot embryo; Embryo endosperm relationship	(4 lectures)	Susanta Kumar Maity	
	Unit 8: Apomixis and polyembryony Definition, types and Practical applications	(4 lectures)	Susanta Kumar Maity	

Semester IV (AY 2019-2021)		Period: to		
Paper: GE4P (Plant Anatomy and Embryology) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of meristems through permanent slides and photographs.	(1 lectures)	Susanta Kumar Maity	
2	2. Tissues (parenchyma, collenchyma and sclerenchyma); Macerated xylary elements, Phloem (Permanent slides, photographs)	(1 lectures)	Susanta Kumar Maity	
3	3. Stem: Monocot: <i>Zea mays</i> ; Dicot: <i>Helianthus</i> ; Secondary: <i>Helianthus</i> (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
4	4. Root: Monocot: <i>Zea mays</i> ; Dicot: <i>Helianthus</i> ; Secondary: <i>Helianthus</i> (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
5	5. Leaf: Dicot and Monocot leaf (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
6	6. Adaptive anatomy: Xerophyte (<i>Nerium</i> leaf); Hydrophyte (<i>Hydrilla</i> stem).	(2 lectures)	Susanta Kumar Maity	
7	7. Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides).	(1 lectures)	Susanta Kumar Maity	
8	8. Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/ campylotropous.	(1 lectures)	Susanta Kumar Maity	
9	9. Female gametophyte: <i>Polygonum</i> (monosporic) type of Embryo sac Development (Permanent slides/photographs).	(1 lectures)	Susanta Kumar Maity	
10	10. Ultrastructure of mature egg apparatus cells through electron micrographs.	(1 lectures)	Susanta Kumar Maity	
11	11. Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).	(1 lectures)	Susanta Kumar Maity	
12	12. Dissection of embryo/endosperm from developing seeds.	(1 lectures)	Susanta Kumar Maity	
13	13. Calculation of percentage of germinated pollen in a given medium.	(1 lectures)	Susanta Kumar Maity	

Semester IV (AY 2019-2021)		Period: _____ to _____		
Paper: SEC2T (Mushroom Culture Technology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India - <i>Volvariellavolvacea</i> , <i>Pleurotuscitrinopileatus</i> , <i>Agaricusbisporus</i> .		Dr.Nilay Kumar Maitra	
2	Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.		Dr.Nilay Kumar Maitra	
3	Unit 3: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.		Dr.Nilay Kumar Maitra	
4	Unit 4: Food Preparation:Types of foods prepared from mushroom.Research Centres - National level and Regional level.Cost benefit ratio - Marketing in India and abroad, Export Value.		Dr.Nilay Kumar Maitra	

**Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)**

Semester I (AY 2018-2020)		Period: _____ to _____		
Paper: GE1T (Biodiversity (Microbes, Algae, Fungi and Archegoniate)) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Microbes Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.	(12 lectures)	Sk Md Ismail Al Amin	
2	Unit 2: Algae General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: <i>Nostoc</i> , <i>Chlamydomonas</i> , <i>Oedogonium</i> , <i>Vaucheria</i> , <i>Fucus</i> , <i>Polysiphonia</i> . Economic importance of algae.	(10 lectures)	Susanta Kumar Maity	
3	Unit 3: Fungi Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of <i>Rhizopus</i> (Zygomycota) <i>Penicillium</i> , <i>Alternaria</i> (Ascomycota), <i>Puccinia</i> , <i>Agaricus</i> (Basidiomycota); Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.	(10 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Introduction to Archegoniate Unifying features of archegoniates, Transition to land habit, Alternation of generations.	(10 lectures)	Sk Md Ismail Al Amin	
5	Unit 5: Bryophytes General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of <i>Marchantia</i> and <i>Funaria</i> . (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of <i>Sphagnum</i> .			
6	Unit 6: Pteridophytes General characteristics, classification, Early land plants (<i>Cooksonia</i> and <i>Rhynia</i>). Classification (up to family), morphology, anatomy and reproduction of <i>Selaginella</i> , <i>Equisetum</i> and <i>Pteris</i> . (Developmental details not to be included). Heterospory and seed habit, stellar evolution. Ecological and economical importance of Pteridophytes.	(10 lectures)	Susanta Kumar Maity	
7	Unit 7: Gymnosperms General characteristics; Classification (up to family), morphology, anatomy and reproduction of <i>Cycas</i> and <i>Pinus</i> (Developmental details not to be included). Ecological and economical importance.	(4 lectures)	Susanta Kumar Maity	

Semester I (AY 2018-2020)		Period: _____ to _____		
Paper: GE1P (Biodiversity (Microbes, Algae, Fungi and Archegoniate)) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle. 2. Types of Bacteria from temporary/permanent slides/ photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule. 3. Gram staining	(4 lectures)	Sk Md Ismail Al Amin	
2	3. Study of vegetative and reproductive structures of <i>Nostoc</i> , <i>Chlamydomonas</i> (electron micrographs), <i>Oedogonium</i> , <i>Vaucheria</i> , <i>Fucus*</i> and <i>Polysiphonia</i> through temporary preparations and permanent slides. (* <i>Fucus</i> - Specimen and permanent slides)	(6 lectures)	Susanta Kumar Maity	
3	4. <i>Rhizopus</i> and <i>Penicillium</i> : Asexual stage from temporary mounts and sexual Structures through permanent slides. 5. <i>Alternaria</i> : Specimens/photographs and tease mounts. 6. <i>Puccinia</i> : Herbarium specimens of Black Stem Rust of Wheat and infected Barberryleaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts. 7. <i>Agaricus</i> : Specimens of button stage and full grown mushroom; Sectioning of gills of <i>Agaricus</i> . 8. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) 9. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)	(6 lectures)	Dr. Nilay Kumar Maitra	
4	10. <i>Marchantia</i> - morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemmacup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides). 11. <i>Funaria</i> - morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores(temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.	(4 lectures)	Sk Md Ismail Al Amin	
	12. <i>Selaginella</i> - morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide). 14. <i>Equisetum</i> - morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry)(temporary slides); t.s. rhizome (permanent slide). 13. <i>Pteris</i> - morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores(temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide). 14. <i>Cycas</i> - morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide). 15. <i>Pinus</i> - morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, , l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. & r.l.s. stem (permanent slide).	(6 lectures)	Susanta Kumar Maity	

**Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)**

Semester II (AY 2018-2020)		Period:	to	
Paper: GE2T (Plant Ecology and Taxonomy) (Theory)		Full Marks: 40	Credit: 04	
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit- 1: Introduction Unit- 2: Ecological factors Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes	(4 lectures)	Dr. Nilay Kumar Maitra	
2	Unit -3: Plant communities Characters; Ecotone and edge effect; Succession; Processes and types	(2 lectures)	Dr. Nilay Kumar Maitra	
3	Unit- 4: Ecosystem Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Bio-geochemical cycling; Cycling of carbon, nitrogen and Phosphorous	(4 lectures)	Dr. Nilay Kumar Maitra	
4	Unit- 5: Phytogeography Principle of Biogeographical zone; Endemism.	(2 lectures)	Dr. Nilay Kumar Maitra	
5	Unit- 6: Introduction to plant taxonomy Identification, Classification, Nomenclature.	(2 lectures)	Susanta Kumar Maity	
6	Unit- 7 : Identification Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access	(2 lectures)	Susanta Kumar Maity	
7	Unit 8 : Taxonomic evidences from palynology, cytology, phytochemistry and molecular data.	(2 lectures)	Susanta Kumar Maity	
8	Unit 9 : Taxonomic hierarchy Ranks, categories and taxonomic groups	(2 lectures)	Susanta Kumar Maity	
9	Unit 10: Botanical nomenclature Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.	(4 lectures)	Susanta Kumar Maity	
10	Unit 11: Classification Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).	(2 lectures)	Susanta Kumar Maity	
	Unit 12: Biometrics, numerical taxonomy and cladistics Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences).	(2 lectures)	Susanta Kumar Maity	

Semester II (AY 2018-2020)		Period: _____ to _____		
Paper: GE2P (Plant Ecology and Taxonomy) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	(2 lectures)	Dr. Nilay Kumar Maitra	
2	2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.	(3 lectures)	Dr. Nilay Kumar Maitra	
3	3. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.	(3 lectures)	Dr. Nilay Kumar Maitra	
4	4. (a) Study of morphological adaptations of hydrophytes and xerophytes (four each). (b) Study of biotic interactions of the following: Stem parasite (<i>Cuscuta</i>), Root parasite (<i>Orobancha</i>), Epiphytes, Predation (Insectivorous plants)	(4 lectures)	Susanta Kumar Maity	
	5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)	(2 lectures)	Dr. Nilay Kumar Maitra	
	6. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law	(2 lectures)	Dr. Nilay Kumar Maitra	
	7. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Brassicaceae - <i>Brassica</i> , <i>Alyssum</i> / <i>Iberis</i> ; Asteraceae - <i>Sonchus</i> / <i>Launaea</i> , <i>Vernonia</i> / <i>Ageratum</i> , <i>Eclipta</i> / <i>Tridax</i> ; Solanaceae - <i>Solanum nigrum</i> , <i>Withania</i> ; Lamiaceae - <i>Salvia</i> , <i>Ocimum</i> ; Liliaceae - <i>Asphodelus</i> / <i>Lilium</i> / <i>Allium</i> .	(8 lectures)	Susanta Kumar Maity	
	8. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).	(4 lectures)	Sk Md Ismail Al Amin	

**Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)**

Semester III (AY 2018-2020)		Period:	to		
Paper: GE3T (Economic Botany and Plant Biotechnology) (Theory)		Full Marks: 40	Credit: 04		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	Unit 1: Origin of Cultivated Plants: Concept of centres of origin, their importance with reference to Vavilov's work.	(4 lectures)	Dr. Nilay Kumar Maitra		
2	Unit 2: Cereals: Wheat -Origin, morphology, uses	(2 lectures)	Dr. Nilay Kumar Maitra		
3	Unit 3: Legumes: General account with special reference to Gram and soybean	(2 lectures)	Dr. Nilay Kumar Maitra		
4	Unit 4: Spices: General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
5	Unit 5: Beverages :Tea (morphology, processing, uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
6	Unit 6: Oils and Fats: General description with special reference to groundnut	(2 lectures)	Dr. Nilay Kumar Maitra		
7	Unit 7: Fibre Yielding Plants: General description with special reference to Cotton (Botanical name, family, part used, morphology and uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
8	Unit 8: Introduction to biotechnology	(2 lectures)	Susanta Kumar Maity		
9	Unit 9: Plant tissue culture: Micropropagation ; haploid production through androgenesis and gynogenesis; brief account of embryo and endosperm culture with their applications.	(8 lectures)	Susanta Kumar Maity		
10	Unit 10: Recombinant DNA Techniques Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. Hybridoma and monoclonal antibodies, ELISA and Immuno detection. Molecular diagnosis of human disease, Human gene Therapy	(10 lectures)	Sk Md Ismail Al Amin		

Semester III (AY 2018-2020)		Period:	to		
Paper: GE3P (Economic Botany and Plant Biotechnology) (Practical)		Full Marks: 20	Credit:02		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	1. Study of economically important plants : Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and micro chemical tests	(6 lectures)	Dr. Nilay Kumar Maitra		
2	2. Familiarization with basic equipments in tissue culture.	(2 lectures)	Susanta Kumar Maity		
3	3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.	(2 lectures)	Susanta Kumar Maity		
4	4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.	(4 lectures)	Sk Md Ismail Al Amin		

Semester III (AY 2018-2020)		Period: _____ to _____		
Paper: SEC1T (Biofertilizers) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit- 1: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.</p> <p>Unit- 2: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.</p> <p>Unit- 3: Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.</p> <p>Unit- 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.</p> <p>Unit-5: Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.</p>	(40 lectures)	Dr.Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany GENERAL; CBCS)**

Semester IV (AY 2018-2020)		Period: _____ to _____		
Paper: GE4T (Plant Anatomy and Embryology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Meristematic and permanent tissues Root and shoot apical meristems; Simple and complex tissues	(2 lectures)	Susanta Kumar Maity	
2	Unit 2: Organs Structure of dicot and monocot root stem and leaf.	(4 lectures)	Susanta Kumar Maity	
3	Unit 3: Secondary Growth Vascular cambium – structure and function, seasonal activity. Secondary growth in root and stem, Wood (heartwood and sapwood)	(4 lectures)	Susanta Kumar Maity	
4	Unit 4: Adaptive and protective systems Epidermis, cuticle, stomata; General account of adaptations in xerophytes and hydrophytes.	(4 lectures)	Susanta Kumar Maity	
5	Unit 5: Structural organization of flower Structure of anther and pollen; Structure and types of ovules; Types of embryo sacs, organization and ultrastructure of mature embryo sac.	(4 lectures)	Susanta Kumar Maity	
6	Unit 6: Pollination and fertilization Pollination mechanisms and adaptations; Double fertilization; Seed-structure appendages and dispersal mechanisms.	(4 lectures)	Susanta Kumar Maity	
7	Unit 7: Embryo and endosperm Endosperm types, structure and functions; Dicot and monocot embryo; Embryo endosperm relationship	(4 lectures)	Susanta Kumar Maity	

	Unit 8: Apomixis and polyembryony Definition, types and Practical applications	(4 lectures)	Susanta Kumar Maity	
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Semester IV (AY 2018-2020)		Period: _____ to _____		
Paper: GE4P (Plant Anatomy and Embryology) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of meristems through permanent slides and photographs.	(1 lectures)	Susanta Kumar Maity	
2	2. Tissues (parenchyma, collenchyma and sclerenchyma); Macerated xylary elements, Phloem (Permanent slides, photographs)	(1 lectures)	Susanta Kumar Maity	
3	3. Stem: Monocot: <i>Zea mays</i> ; Dicot: <i>Helianthus</i> ; Secondary: <i>Helianthus</i> (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
4	4. Root: Monocot: <i>Zea mays</i> ; Dicot: <i>Helianthus</i> ; Secondary: <i>Helianthus</i> (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
5	5. Leaf: Dicot and Monocot leaf (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
6	6. Adaptive anatomy: Xerophyte (<i>Nerium</i> leaf); Hydrophyte (<i>Hydrilla</i> stem).	(2 lectures)	Susanta Kumar Maity	
7	7. Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides).	(1 lectures)	Susanta Kumar Maity	
8	8. Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/ campylotropous.	(1 lectures)	Susanta Kumar Maity	
9	9. Female gametophyte: <i>Polygonum</i> (monosporic) type of Embryo sac Development (Permanent slides/photographs).	(1 lectures)	Susanta Kumar Maity	
10	10. Ultrastructure of mature egg apparatus cells through electron micrographs.	(1 lectures)	Susanta Kumar Maity	
11	11. Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).	(1 lectures)	Susanta Kumar Maity	
12	12. Dissection of embryo/endosperm from developing seeds.	(1 lectures)	Susanta Kumar Maity	
13	13. Calculation of percentage of germinated pollen in a given medium.	(1 lectures)	Susanta Kumar Maity	

Semester IV (AY 2018-2020)		Period: _____ to _____		
Paper: SEC2T (Mushroom Culture Technology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India - <i>Volvariellavolvacea</i> , <i>Pleurotuscitrinopileatus</i> , <i>Agaricusbisporus</i> .		Dr.Nilay Kumar Maitra	
2	Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop, low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.		Dr.Nilay Kumar Maitra	
3	Unit 3: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.		Dr.Nilay Kumar Maitra	
4	Unit 4: Food Preparation:Types of foods prepared from mushroom.Research Centres - National level and Regional level.Cost benefit ratio - Marketing in India and abroad, Export Value.		Dr.Nilay Kumar Maitra	

Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)

Semester I (AY 2017-2019)		Period: _____ to _____		
Paper: GE1T (Biodiversity (Microbes, Algae, Fungi and Archegoniate)) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Microbes Viruses – Discovery, general structure, replication (general account), DNA virus (T-phage); Lytic and lysogenic cycle, RNA virus (TMV); Economic importance; Bacteria – Discovery, General characteristics and cell structure; Reproduction – vegetative, asexual and recombination (conjugation, transformation and transduction); Economic importance.	(12 lectures)	Sk Md Ismail Al Amin	
2	Unit 2: Algae General characteristics; Ecology and distribution; Range of thallus organization and reproduction; Classification of algae; Morphology and life-cycles of the following: <i>Nostoc</i> , <i>Chlamydomonas</i> , <i>Oedogonium</i> , <i>Vaucheria</i> , <i>Fucus</i> , <i>Polysiphonia</i> . Economic importance of algae.	(10 lectures)	Susanta Kumar Maity	
3	Unit 3: Fungi Introduction- General characteristics, ecology and significance, range of thallus organization, cell wall composition, nutrition, reproduction and classification; True Fungi- General characteristics, ecology and significance, life cycle of <i>Rhizopus</i> (Zygomycota) <i>Penicillium</i> , <i>Alternaria</i> (Ascomycota), <i>Puccinia</i> , <i>Agaricus</i> (Basidiomycota); Symbiotic Associations-Lichens: General account, reproduction and significance; Mycorrhiza: ectomycorrhiza and endomycorrhiza and their significance.	(10 lectures)	Dr. Nilay Kumar Maitra	
4	Unit 4: Introduction to Archegoniate Unifying features of archegoniates, Transition to land habit, Alternation of generations.	(10 lectures)	Sk Md Ismail Al Amin	
5	Unit 5: Bryophytes General characteristics, adaptations to land habit, Classification, Range of thallus organization. Classification (up to family), morphology, anatomy and reproduction of <i>Marchantia</i> and <i>Funaria</i> . (Developmental details not to be included). Ecology and economic importance of bryophytes with special mention of <i>Sphagnum</i> .			
6	Unit 6: Pteridophytes General characteristics, classification, Early land plants (<i>Cooksonia</i> and <i>Rhynia</i>). Classification (up to family), morphology, anatomy and reproduction of <i>Selaginella</i> , <i>Equisetum</i> and <i>Pteris</i> . (Developmental details not to be included). Heterospory and seed habit, stellar evolution. Ecological and economical importance of Pteridophytes.	(10 lectures)	Susanta Kumar Maity	
7	Unit 7: Gymnosperms General characteristics; Classification (up to family), morphology, anatomy and reproduction of <i>Cycas</i> and <i>Pinus</i> (Developmental details not to be included). Ecological and economical importance.	(4 lectures)	Susanta Kumar Maity	

Semester I (AY 2017-2019)		Period: _____ to _____		
Paper: GE1P (Biodiversity (Microbes, Algae, Fungi and Archegoniate)) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. EMs/Models of viruses – T-Phage and TMV, Line drawing/Photograph of Lytic and Lysogenic Cycle. 2. Types of Bacteria from temporary/permanent slides/ photographs; EM bacterium; Binary Fission; Conjugation; Structure of root nodule. 3. Gram staining	(4 lectures)	Sk Md Ismail Al Amin	
2	3. Study of vegetative and reproductive structures of <i>Nostoc</i> , <i>Chlamydomonas</i> (electron micrographs), <i>Oedogonium</i> , <i>Vaucheria</i> , <i>Fucus</i> * and <i>Polysiphonia</i> through temporary preparations and permanent slides. (* <i>Fucus</i> - Specimen and permanent slides)	(6 lectures)	Susanta Kumar Maity	
3	4. <i>Rhizopus</i> and <i>Penicillium</i> : Asexual stage from temporary mounts and sexual Structures through permanent slides. 5. <i>Alternaria</i> : Specimens/photographs and tease mounts. 6. <i>Puccinia</i> : Herbarium specimens of Black Stem Rust of Wheat and infected Barberryleaves; section/tease mounts of spores on Wheat and permanent slides of both the hosts. 7. <i>Agaricus</i> : Specimens of button stage and full grown mushroom; Sectioning of gills of <i>Agaricus</i> . 8. Lichens: Study of growth forms of lichens (crustose, foliose and fruticose) 9. Mycorrhiza: ecto mycorrhiza and endo mycorrhiza (Photographs)	(6 lectures)	Dr. Nilay Kumar Maitra	
4	10. <i>Marchantia</i> - morphology of thallus, w.m. rhizoids and scales, v.s. thallus through gemmacup, w.m. gemmae (all temporary slides), v.s. antheridiophore, archegoniophore, l.s. sporophyte (all permanent slides). 11. <i>Funaria</i> - morphology, w.m. leaf, rhizoids, operculum, peristome, annulus, spores(temporary slides); permanent slides showing antheridial and archegonial heads, l.s. capsule and protonema.	(4 lectures)	Sk Md Ismail Al Amin	
	12. <i>Selaginella</i> - morphology, w.m. leaf with ligule, t.s. stem, w.m. strobilus, w.m. microsporophyll and megasporophyll (temporary slides), l.s. strobilus (permanent slide). 14. <i>Equisetum</i> - morphology, t.s. internode, l.s. strobilus, t.s. strobilus, w.m. sporangiophore, w.m. spores (wet and dry)(temporary slides); t.s. rhizome (permanent slide). 13. <i>Pteris</i> - morphology, t.s. rachis, v.s. sporophyll, w.m. sporangium, w.m. spores(temporary slides), t.s. rhizome, w.m. prothallus with sex organs and young sporophyte (permanent slide). 14. <i>Cycas</i> - morphology (coralloid roots, bulbil, leaf), t.s. coralloid root, t.s. rachis, v.s. leaflet, v.s. microsporophyll, w.m. spores (temporary slides), l.s. ovule, t.s. root (permanent slide). 15. <i>Pinus</i> - morphology (long and dwarf shoots, w.m. dwarf shoot, male and female), w.m. dwarf shoot, t.s. needle, t.s. stem, , l.s./t.s. male cone, w.m. microsporophyll, w.m. microspores (temporary slides), l.s. female cone, t.l.s. & r.l.s. stem (permanent slide).	(6 lectures)	Susanta Kumar Maity	

Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)

Semester II (AY 2017-2019)		Period: to		
Paper: GE2T (Plant Ecology and Taxonomy) (Theory)		Full Marks: 40		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit- 1: Introduction Unit- 2: Ecological factors Soil: Origin, formation, composition, soil profile. Water: States of water in the environment, precipitation types. Light and temperature: Variation Optimal and limiting factors; Shelford law of tolerance. Adaptation of hydrophytes and xerophytes	(4 lectures)	Dr. Nilay Kumar Maitra	
2	Unit -3: Plant communities Characters; Ecotone and edge effect; Succession; Processes and types	(2 lectures)	Dr. Nilay Kumar Maitra	
3	Unit- 4: Ecosystem Structure; energy flow trophic organisation; Food chains and food webs, Ecological pyramids production and productivity; Bio-geochemical cycling; Cycling of carbon, nitrogen and Phosphorous	(4 lectures)	Dr. Nilay Kumar Maitra	
4	Unit- 5: Phytogeography Principle of Biogeographical zone; Endemism.	(2 lectures)	Dr. Nilay Kumar Maitra	
5	Unit- 6: Introduction to plant taxonomy Identification, Classification, Nomenclature.	(2 lectures)	Susanta Kumar Maity	
6	Unit- 7 : Identification Functions of Herbarium, important herbaria and botanical gardens of the world and India; Documentation: Flora, Keys: single access and multi-access	(2 lectures)	Susanta Kumar Maity	
7	Unit 8 : Taxonomic evidences from palynology, cytology, phytochemistry and molecular data.	(2 lectures)	Susanta Kumar Maity	
8	Unit 9 : Taxonomic hierarchy Ranks, categories and taxonomic groups	(2 lectures)	Susanta Kumar Maity	
9	Unit 10: Botanical nomenclature Principles and rules (ICN); ranks and names; binominal system, typification, author citation, valid publication, rejection of names, principle of priority and its limitations.	(4 lectures)	Susanta Kumar Maity	
10	Unit 11: Classification Types of classification-artificial, natural and phylogenetic. Bentham and Hooker (upto series), Engler and Prantl (upto series).	(2 lectures)	Susanta Kumar Maity	
	Unit 12: Biometrics, numerical taxonomy and cladistics Characters; variations; OTUs, character weighting and coding; cluster analysis; phenograms, cladograms (definitions and differences).	(2 lectures)	Susanta Kumar Maity	

Semester II (AY 2017-2019)		Period: _____ to _____		
Paper: GE2P (Plant Ecology and Taxonomy) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of instruments used to measure microclimatic variables: Soil thermometer, maximum and minimum thermometer, anemometer, psychrometer/hygrometer, rain gauge and lux meter.	(2 lectures)	Dr. Nilay Kumar Maitra	
2	2. Determination of pH, and analysis of two soil samples for carbonates, chlorides, nitrates, sulphates, organic matter and base deficiency by rapid field test.	(3 lectures)	Dr. Nilay Kumar Maitra	
3	3. Comparison of bulk density, porosity and rate of infiltration of water in soil of three habitats.	(3 lectures)	Dr. Nilay Kumar Maitra	
4	4. (a) Study of morphological adaptations of hydrophytes and xerophytes (four each). (b) Study of biotic interactions of the following: Stem parasite (<i>Cuscuta</i>), Root parasite (<i>Orobancha</i>), Epiphytes, Predation (Insectivorous plants)	(4 lectures)	Susanta Kumar Maity	
	5. Determination of minimal quadrat size for the study of herbaceous vegetation in the college campus by species area curve method. (species to be listed)	(2 lectures)	Dr. Nilay Kumar Maitra	
	6. Quantitative analysis of herbaceous vegetation in the college campus for frequency and comparison with Raunkiaer's frequency distribution law	(2 lectures)	Dr. Nilay Kumar Maitra	
	7. Study of vegetative and floral characters of the following families (Description, V.S. flower, section of ovary, floral diagram/s, floral formula/e and systematic position according to Bentham & Hooker's system of classification): Brassicaceae - <i>Brassica</i> , <i>Alyssum</i> / <i>Iberis</i> ; Asteraceae - <i>Sonchus</i> / <i>Launaea</i> , <i>Vernonia</i> / <i>Ageratum</i> , <i>Eclipta</i> / <i>Tridax</i> ; Solanaceae - <i>Solanum nigrum</i> , <i>Withania</i> ; Lamiaceae - <i>Salvia</i> , <i>Ocimum</i> ; Liliaceae - <i>Asphodelus</i> / <i>Lilium</i> / <i>Allium</i> .	(8 lectures)	Susanta Kumar Maity	
	8. Mounting of a properly dried and pressed specimen of any wild plant with herbarium label (to be submitted in the record book).	(4 lectures)	Sk Md Ismail Al Amin	

**Curriculum Plan (ODD SEMESTER)
(Botany GENERAL; CBCS)**

Semester III (AY 2017-2019)		Period:	to		
Paper: GE3T (Economic Botany and Plant Biotechnology) (Theory)		Full Marks: 40	Credit: 04		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	Unit 1: Origin of Cultivated Plants: Concept of centres of origin, their importance with reference to Vavilov's work.	(4 lectures)	Dr. Nilay Kumar Maitra		
2	Unit 2: Cereals: Wheat -Origin, morphology, uses	(2 lectures)	Dr. Nilay Kumar Maitra		
3	Unit 3: Legumes: General account with special reference to Gram and soybean	(2 lectures)	Dr. Nilay Kumar Maitra		
4	Unit 4: Spices: General account with special reference to clove and black pepper (Botanical name, family, part used, morphology and uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
5	Unit 5: Beverages :Tea (morphology, processing, uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
6	Unit 6: Oils and Fats: General description with special reference to groundnut	(2 lectures)	Dr. Nilay Kumar Maitra		
7	Unit 7: Fibre Yielding Plants: General description with special reference to Cotton (Botanical name, family, part used, morphology and uses)	(2 lectures)	Dr. Nilay Kumar Maitra		
8	Unit 8: Introduction to biotechnology	(2 lectures)	Susanta Kumar Maity		
9	Unit 9: Plant tissue culture: Micropropagation ; haploid production through androgenesis and gynogenesis; brief account of embryo and endosperm culture with their applications.	(8 lectures)	Susanta Kumar Maity		
10	Unit 10: Recombinant DNA Techniques Blotting techniques: Northern, Southern and Western Blotting, DNA Fingerprinting; Molecular DNA markers i.e. RAPD, RFLP, SNPs; DNA sequencing, PCR and Reverse Transcriptase-PCR. Hybridoma and monoclonal antibodies, ELISA and Immuno detection. Molecular diagnosis of human disease, Human gene Therapy	(10 lectures)	Sk Md Ismail Al Amin		

Semester III (AY 2017-2019)		Period:	to		
Paper: GE3P (Economic Botany and Plant Biotechnology) (Practical)		Full Marks: 20	Credit:02		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark	
1	1. Study of economically important plants : Wheat, Gram, Soybean, Black pepper, Clove Tea, Cotton, Groundnut through specimens, sections and micro chemical tests	(6 lectures)	Dr. Nilay Kumar Maitra		
2	2. Familiarization with basic equipments in tissue culture.	(2 lectures)	Susanta Kumar Maity		
3	3. Study through photographs: Anther culture, somatic embryogenesis, endosperm and embryo culture; micropropagation.	(2 lectures)	Susanta Kumar Maity		
4	4. Study of molecular techniques: PCR, Blotting techniques, AGE and PAGE.	(4 lectures)	Sk Md Ismail Al Amin		

Semester III (AY 2017-2019)		Period: _____ to _____		
Paper: SEC1T (Biofertilizers) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit- 1: General account about the microbes used as biofertilizer – Rhizobium – isolation, identification, mass multiplication, carrier based inoculants, Actinorrhizal symbiosis.</p> <p>Unit- 2: Azospirillum: isolation and mass multiplication – carrier based inoculant, associative effect of different microorganisms. Azotobacter: classification, characteristics – crop response to Azotobacter inoculum, maintenance and mass multiplication.</p> <p>Unit- 3: Cyanobacteria (blue green algae), Azolla and Anabaena azollae association, nitrogen fixation, factors affecting growth, blue green algae and Azolla in rice cultivation.</p> <p>Unit- 4: Mycorrhizal association, types of mycorrhizal association, taxonomy, occurrence and distribution, phosphorus nutrition, growth and yield – colonization of VAM – isolation and inoculum production of VAM, and its influence on growth and yield of crop plants.</p> <p>Unit-5: Organic farming – Green manuring and organic fertilizers, Recycling of biodegradable municipal, agricultural and Industrial wastes – biocompost making methods, types and method of vermicomposting – field Application.</p>	(40 lectures)	Dr.Nilay Kumar Maitra	

**Curriculum Plan (EVEN SEMESTER)
(Botany GENERAL; CBCS)**

Semester IV (AY 2017-2019)		Period: _____ to _____		
Paper: GE4T (Plant Anatomy and Embryology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Meristematic and permanent tissues Root and shoot apical meristems; Simple and complex tissues	(2 lectures)	Susanta Kumar Maity	
2	Unit 2: Organs Structure of dicot and monocot root stem and leaf.	(4 lectures)	Susanta Kumar Maity	
3	Unit 3: Secondary Growth Vascular cambium – structure and function, seasonal activity. Secondary growth in root and stem, Wood (heartwood and sapwood)	(4 lectures)	Susanta Kumar Maity	
4	Unit 4: Adaptive and protective systems Epidermis, cuticle, stomata; General account of adaptations in xerophytes and hydrophytes.	(4 lectures)	Susanta Kumar Maity	
5	Unit 5: Structural organization of flower Structure of anther and pollen; Structure and types of ovules; Types of embryo sacs, organization and ultrastructure of mature embryo sac.	(4 lectures)	Susanta Kumar Maity	
6	Unit 6: Pollination and fertilization Pollination mechanisms and adaptations; Double fertilization; Seed-structure appendages and dispersal mechanisms.	(4 lectures)	Susanta Kumar Maity	
7	Unit 7: Embryo and endosperm Endosperm types, structure and functions; Dicot and monocot embryo; Embryo endosperm relationship	(4 lectures)	Susanta Kumar Maity	
	Unit 8: Apomixis and polyembryony Definition, types and Practical applications	(4 lectures)	Susanta Kumar Maity	

Semester IV (AY 2017-2019)		Period: to		
Paper: GE4P (Plant Anatomy and Embryology) (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of meristems through permanent slides and photographs.	(1 lectures)	Susanta Kumar Maity	
2	2. Tissues (parenchyma, collenchyma and sclerenchyma); Macerated xylary elements, Phloem (Permanent slides, photographs)	(1 lectures)	Susanta Kumar Maity	
3	3. Stem: Monocot: <i>Zea mays</i> ; Dicot: <i>Helianthus</i> ; Secondary: <i>Helianthus</i> (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
4	4. Root: Monocot: <i>Zea mays</i> ; Dicot: <i>Helianthus</i> ; Secondary: <i>Helianthus</i> (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
5	5. Leaf: Dicot and Monocot leaf (only Permanent slides).	(1 lectures)	Susanta Kumar Maity	
6	6. Adaptive anatomy: Xerophyte (<i>Nerium</i> leaf); Hydrophyte (<i>Hydrilla</i> stem).	(2 lectures)	Susanta Kumar Maity	
7	7. Structure of anther (young and mature), tapetum (amoeboid and secretory) (Permanent slides).	(1 lectures)	Susanta Kumar Maity	
8	8. Types of ovules: anatropous, orthotropous, circinotropous, amphitropous/ campylotropous.	(1 lectures)	Susanta Kumar Maity	
9	9. Female gametophyte: <i>Polygonum</i> (monosporic) type of Embryo sac Development (Permanent slides/photographs).	(1 lectures)	Susanta Kumar Maity	
10	10. Ultrastructure of mature egg apparatus cells through electron micrographs.	(1 lectures)	Susanta Kumar Maity	
11	11. Pollination types and seed dispersal mechanisms (including appendages, aril, caruncle) (Photographs and specimens).	(1 lectures)	Susanta Kumar Maity	
12	12. Dissection of embryo/endosperm from developing seeds.	(1 lectures)	Susanta Kumar Maity	
13	13. Calculation of percentage of germinated pollen in a given medium.	(1 lectures)	Susanta Kumar Maity	

Semester IV (AY 2017-2019)		Period: to		
Paper: SEC2T (Mushroom Culture Technology) (Theory)		Full Marks: 40		Credit:04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction, history. Nutritional and medicinal value of edible mushrooms; Poisonous mushrooms. Types of edible mushrooms available in India - <i>Volvariellavolvacea</i> , <i>Pleurotuscitrinopileatus</i> , <i>Agaricusbisporus</i> .		Dr.Nilay Kumar Maitra	
2	Unit 2: Cultivation Technology : Infrastructure: substrates (locally available) Polythene bag, vessels, Inoculation hook, inoculation loop,		Dr.Nilay Kumar Maitra	

	low cost stove, sieves, culture rack, mushroom unit (Thatched house) water sprayer, tray, small polythene bag. Pure culture: Medium, sterilization, preparation of spawn, multiplication. Mushroom bed preparation - paddy straw, sugarcane trash, maize straw, banana leaves. Factors affecting the mushroom bed preparation - Low cost technology, Composting technology in mushroom production.			
3	Unit 3: Storage and nutrition : Short-term storage (Refrigeration - upto 24 hours) Long term Storage (canning, pickels, papads), drying, storage in saltsolutions. Nutrition - Proteins - amino acids, mineral elements nutrition - Carbohydrates, Crude fibre content - Vitamins.		Dr.Nilay Kumar Maitra	
4	Unit 4: Food Preparation:Types of foods prepared from mushroom.Research Centres - National level and Regional level.Cost benefit ratio - Marketing in India and abroad, Export Value.		Dr.Nilay Kumar Maitra	

CURRICULUM PLAN (ODD SEMESTER)**(Chemistry GE; CBCS)**

Semester I (AY 2022-2023)		Period: 19.09.2022 to 4.02.2023		
Paper: GE1T (Theory)		Full Marks: 40(T)+10(IA)+5(CA)		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<u>Section B: Organic Chemistry</u> StereoChemistry, Aliphatic Hydrocarbons	20	Dr. Sutapa Ray	
2	<u>Section A: Inorganic Chemistry</u> Atomic Structure, Chemical Periodicity, Redox Reactions	20	Dr. Soumya Sundar Mati	
3	<u>Section A: Inorganic Chemistry</u> Acid and Bases, <u>Section B: Organic Chemistry</u> <u>Fundamentals of Organic Chemistry, Nucleophilic substitution and Elimination reactions</u>	20	Hillol Khatua	

Semester I (AY 2022-2023)		Period: 19.09.2022 to 4.02.2023		
Paper: GE1P (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Atomic Structure, Chemical Periodicity, Acid and Bases, Redox Reactions, General Organic Chemistry and Aliphatic Hydrocarbon	60	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

(Chemistry General; CBCS)

Semester I (AY 2022-2023)		Period: 19.09.2022 to 4.02.2023		
Paper: DSC1AT(CC1)(Theory)		Full Marks: 60(T)+10(IA)+5 (CA)		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Section A: Inorganic Chemistry Atomic Structure	20	Dr. Soumya Sundar Mati	
2	Section A: Inorganic Chemistry Chemical Bonding and Molecular structure	10	Hillol Khatua	
3	Section B: Organic Chemistry StereoChemistry, Aliphatic Hydrocarbons	20	Dr. Sutapa Ray	
4	Section B: Organic Chemistry Fundamentals of Organic Chemistry	10	Hillol Khatua	

Semester I (AY 2022-2023)		Period: 19.09.2022 to 4.02.2023		
Paper: DSC1AP(CC1)(Practical)		Full Marks: 20		Credit:2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Atomic Structure, Chemical Periodicity, Acid and Bases, Redox Reactions, General Organic Chemistry and Aliphatic Hydrocarbon	60	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

CURRICULUM PLAN (EVEN SEMESTER)
(Chemistry GE; CBCS)

Semester II (AY 2022-2023)		Period: 20.3.2023 to 28.7.2023		
Paper: GE2 (Theory)		Full Marks: 40(T)+10(IA)+5(CA)		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Section A: Physical Chemistry Kinetic Theory of Gases and Real gases, Liquids, Solids	20	Dr. Soumya Sundar Mati	
2	Section A: Physical Chemistry Chemical Kinetics	10	Hillol Khatua	
3	Section B: Inorganic Chemistry-II Chemical Bonding and Molecular Structure (Covalent Bonding to MO), Comparative study of p-block elements	20	Dr. Sutapa Ray	
4	Section B: Inorganic Chemistry-II Chemical Bonding and Molecular Structure (Ionic Bonding)	10	Hillol Khatua	

Semester II (AY 2022-2023)		Period: 20.3.2023 to 28.7.2023		
Paper: GE2P (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	STATES OF MATTER & CHEMICAL KINETICS, CHEMICAL BONDING & MOLECULAR STRUCTURE, p-BLOCK ELEMENTS	60	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

(ENVS AECC; CBCS)

Semester II (AY 2022-2023)		Period: 20.3.2023 to 28.7.2023		
Paper: ENVS (AECC) (Theory)		Full Marks: 50(T)+15(IA)+5(CA)+30(P)		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit-1: Introduction to environmental studies	2	Hillol Khatua	
2	Unit-2: Ecosystem	6	Dr. Sutapa Ray	
3	Unit-3: Natural Resources: Renewable and Non-renewable resources	8	Dr. Sutapa Ray	
4	Unit-4: Biodiversity and conservation	8	Hillol Khatua	
5	Unit-5: Environmental Pollution	8	Dr. Soumya Sundar Mati	
6	Unit-6: Environmental Policies and Practices	7	Dr. Soumya Sundar Mati	
7	Unit-7: Human Communities and the Environment	6	Hillol Khatua	
8	Unit-8: Field work	5	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

CURRICULUM PLAN(EVEN SEMESTER)
(Chemistry General; CBCS)

Semester II (AY 2022-2023)		Period: 20.3.2023 to 28.7.2023		
Paper: DSC1BT(CC2)(Theory)		Full Marks: 60(T)+10(IA)+5 (CA)		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Section A: Physical Chemistry Chemical Energetic, Chemical Equilibrium	20	Dr. Soumya Sundar Mati	
2	Section A: Physical Chemistry Ionic Equilibria	10	Hillol Khatua	
3	Section B: Organic Chemistry Aromatic Hydrocarbon to Phenols	20	Dr. Sutapa Ray	
4	Section B: Organic Chemistry Ethers to Aldehydes & Ketones	10	Hillol Khatua	

Semester II (AY 2022-2023)		Period: 20.3.2023 to 28.7.2023		
Paper: DSC1BP(CC2)(Practical)		Full Marks: 20		Credit:2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Chemical Energetics, Equilibria & Functional Organic Chemistry	60	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

CURRICULUM PLAN (ODD SEMESTER)
(Chemistry GE; CBCS)

Semester I (AY 2021-2022) Online+ Offline		Period: 1.10.2021 to 24.02.2022		
Paper: GE1T (Theory)		Full Marks: 40(T)+10(IA)+5(CA)		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<u>Section B: Organic Chemistry</u> StereoChemistry, Aliphatic Hydrocarbons	20	Dr. Sutapa Ray	
2	<u>Section A: Inorganic Chemistry</u> Atomic Structure, Chemical Periodicity, Redox Reactions	20	Dr. Soumya Sundar Mati	
3	<u>Section A: Inorganic Chemistry</u> Acid and Bases, <u>Section B: Organic Chemistry</u> <u>Fundamentals of Organic Chemistry, Nucleophilic substitution and Elimination reactions</u>	20	Hillol Khatua	

Semester I (AY 2021-2022) Online+ Offline		Period: 1.10.2021 to 24.02.2022		
Paper: GE1P (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Atomic Structure, Chemical Periodicity, Acid and Bases, Redox Reactions, General Organic Chemistry and Aliphatic Hydrocarbon	60	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

(Chemistry General; CBCS)

Semester I (AY 2021-2022) Online+ Offline		Period: 1.10.2021 to 24.02.2022		
Paper: DSC1AT(CC1)(Theory)		Full Marks: 60(T)+10(IA)+5 (CA)		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Section A: Inorganic Chemistry Atomic Structure	20	Dr. Soumya Sundar Mati	
2	Section A: Inorganic Chemistry Chemical Bonding and Molecular structure	10	Hillol Khatua	
3	Section B: Organic Chemistry StereoChemistry, Aliphatic Hydrocarbons	20	Dr. Sutapa Ray	
4	Section B: Organic Chemistry Fundamentals of Organic Chemistry	10	Hillol Khatua	

Semester I (AY 2021-2022) Online+ Offline		Period: 1.10.2021 to 24.02.2022		
Paper: DSC1AP(CC1)(Practical)		Full Marks: 20		Credit:2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Atomic Structure, Chemical Periodicity, Acid and Bases, Redox Reactions, General Organic Chemistry and Aliphatic Hydrocarbon	60	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

CURRICULUM PLAN(EVEN SEMESTER)
(Chemistry GE; CBCS)

Semester II (AY 2021-2022)		Period: 01.4.2022 to 09.7.2022		
Paper: GE2 (Theory)		Full Marks: 40(T)+10(IA)+5(CA)		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Section A: Physical Chemistry Kinetic Theory of Gases and Real gases, Liquids, Solids	20	Dr. Soumya Sundar Mati	
2	Section A: Physical Chemistry Chemical Kinetics	10	Hillol Khatua	
3	Section B: Inorganic Chemistry-II Chemical Bonding and Molecular Structure (Covalent Bonding to MO), Comparative study of p-block elements	20	Dr. Sutapa Ray	
4	Section B: Inorganic Chemistry-II Chemical Bonding and Molecular Structure (Ionic Bonding)	10	Hillol Khatua	

Semester II (AY 2021-2022)		Period: 01.4.2022 to 09.7.2022		
Paper: GE2P (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	STATES OF MATTER & CHEMICAL KINETICS, CHEMICAL BONDING & MOLECULAR STRUCTURE, p-BLOCK ELEMENTS	60	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

(ENVS AECC; CBCS)

Semester II (AY 2021-2022)		Period: 01.4.2022 to 09.7.2022		
Paper: ENVS (AECC) (Theory)		Full Marks: 50(T)+15(IA)+5(CA)+30(P)		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit-1: Introduction to environmental studies	2	Hillol Khatua	
2	Unit-2: Ecosystem	6	Dr. Sutapa Ray	
3	Unit-3: Natural Resources: Renewable and Non-renewable resources	8	Dr. Sutapa Ray	
4	Unit-4: Biodiversity and conservation	8	Hillol Khatua	
5	Unit-5: Environmental Pollution	8	Dr. Soumya Sundar Mati	
6	Unit-6: Environmental Policies and Practices	7	Dr. Soumya Sundar Mati	
7	Unit-7: Human Communities and the Environment	6	Hillol Khatua	
8	Unit-8: Field work	5	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

CURRICULUM PLAN(EVEN SEMESTER)
(Chemistry General; CBCS)

Semester II (AY 2021-2022)		Period: 01.4.2022 to 09.7.2022		
Paper: DSC1BT(CC2)(Theory)		Full Marks: 60(T)+10(IA)+5 (CA)		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Section A: Physical Chemistry Chemical Energetic, Chemical Equilibrium	20	Dr. Soumya Sundar Mati	
2	Section A: Physical Chemistry Ionic Equilibria	10	Hillol Khatua	
3	Section B: Organic Chemistry Aromatic Hydrocarbon to Phenols	20	Dr. Sutapa Ray	
4	Section B: Organic Chemistry Ethers to Aldehydes & Ketones	10	Hillol Khatua	

Semester II (AY 2021-2022)		Period: 01.4.2022 to 09.7.2022		
Paper: DSC1BP(CC2)(Practical)		Full Marks: 20		Credit:2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Chemical Energetics, Equilibria & Functional Organic Chemistry	60	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

CURRICULUM PLAN (ODD SEMESTER)
(Chemistry GE; CBCS)

Semester I (AY 2020-2021) Online		Period: 16.12.2020 to March 2021		
Paper: GE1T (Theory)		Full Marks: 40(T)+10(IA)+5(CA)		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<u>Section B: Organic Chemistry</u> StereoChemistry, Aliphatic Hydrocarbons	20	Dr. Sutapa Ray	
2	<u>Section A: Inorganic Chemistry</u> Atomic Structure, Chemical Periodicity, Redox Reactions	20	Dr. Soumya Sundar Mati	
3	<u>Section A: Inorganic Chemistry</u> Acid and Bases, <u>Section B: Organic Chemistry</u> <u>Fundamentals of Organic Chemistry, Nucleophilic substitution and Elimination reactions</u>	20	Hillol Khatua	

Semester I (AY 2020-2021) Online		Period: 16.12.2020 to March 2021		
Paper: GE1P (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Atomic Structure, Chemical Periodicity, Acid and Bases, Redox Reactions, General Organic Chemistry and Aliphatic Hydrocarbon	60	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

**CURRICULUM PLAN(EVEN SEMESTER)
(Chemistry GE; CBCS)**

Semester II (AY 2020-2021) Online		Period: 26.4.2021 to 24.8.2021		
Paper: GE2 (Theory)		Full Marks: 40(T)+10(IA)+5(CA)		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Section A: Physical Chemistry Kinetic Theory of Gases and Real gases, Liquids, Solids	20	Dr. Soumya Sundar Mati	
2	Section A: Physical Chemistry Chemical Kinetics	10	Hillol Khatua	
3	Section B: Inorganic Chemistry-II Chemical Bonding and Molecular Structure (Covalent Bonding to MO), Comparative study of p-block elements	20	Dr. Sutapa Ray	
4	Section B: Inorganic Chemistry-II Chemical Bonding and Molecular Structure (Ionic Bonding)	10	Hillol Khatua	

Semester II (AY 2020-2021) Online		Period: 26.4.2021 to 24.8.2021		
Paper: GE2P (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	STATES OF MATTER & CHEMICAL KINETICS, CHEMICAL BONDING & MOLECULAR STRUCTURE, p-BLOCK ELEMENTS	60	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

(ENVS AECC; CBCS)

Semester II (AY 2020-2021) Online		Period: 26.4.2021 to 24.8.2021		
Paper: ENVS (AECC) (Theory)		Full Marks: 50(T)+15(IA)+5(CA)+30(P)		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit-1: Introduction to environmental studies	2	Hillol Khatua	
2	Unit-2: Ecosystem	6	Dr. Sutapa Ray	
3	Unit-3: Natural Resources: Renewable and Non-renewable resources	8	Dr. Sutapa Ray	
4	Unit-4: Biodiversity and conservation	8	Hillol Khatua	
5	Unit-5: Environmental Pollution	8	Dr. Soumya Sundar Mati	
6	Unit-6: Environmental Policies and Practices	7	Dr. Soumya Sundar Mati	
7	Unit-7: Human Communities and the Environment	6	Hillol Khatua	
8	Unit-8: Field work	5	Dr. Soumya Sundar Mati, Dr. Sutapa Ray & Hillol Khatua	

CURRICULUM PLAN (ODD SEMESTER)
(Chemistry GE; CBCS)

Semester I (AY 2019-2020)		Period: 22.07.2019 to 21.11.2019		
Paper: GE1T (Theory)		Full Marks: 40(T)+10(IA)+5(CA)		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<u>Section B: Organic Chemistry</u> Fundamentals of Organic Chemistry, StereoChemistry, Nucleophilic substitution and Elimination reactions, Aliphatic Hydrocarbons	30	Dr. Sutapa Ray	
2	<u>Section A: Inorganic Chemistry</u> Atomic Structure, Chemical Periodicity, Acid and Bases, Redox Reactions	30	Dr. Soumya Sundar Mati	

Semester I (AY 2018-2019)		Period: 18.07.2018 to 16.11.2018		
Paper: GE1P (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Atomic Structure, Chemical Periodicity, Acid and Bases, Redox Reactions, General Organic Chemistry and Aliphatic Hydrocarbon	60	Dr. Soumya Sundar Mati & Dr. Sutapa Ray	

**CURRICULUM PLAN(EVEN SEMESTER)
(Chemistry GE; CBCS)**

Semester II (AY 2019-2020) Online from April		Period: 02.01.2020 to 06.5.2020		
Paper: GE2 (Theory)		Full Marks: 40(T)+10(IA)+5(CA)		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Section A: Physical Chemistry-I Kinetic Theory of Gases and Real gases, Liquids, Solids, Chemical Kinetics	30	Dr. Soumya Sundar Mati	
2	Section B: Inorganic Chemistry-II Chemical Bonding and Molecular Structure, Comparative study of p-block elements	30	Dr. Sutapa Ray	

Semester II (AY 2019-2020) Online from April		Period: 02.01.2020 to 06.5.2020		
Paper: GE2P (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	STATES OF MATTER & CHEMICAL KINETICS, CHEMICAL BONDING & MOLECULAR STRUCTURE, p-BLOCK ELEMENTS	60	Dr. Soumya Sundar Mati & Dr. Sutapa Ray	

(ENVS AECC; CBCS)

Semester II (AY 2019-2020) Online from April		Period: 02.01.2020 to 06.5.2020		
Paper: ENVS (AECC) (Theory)		Full Marks: 50(T)+15(IA)+5(CA)+30(P)		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit-1: Introduction to environmental studies	2	Dr. Soumya Sundar Mati	
2	Unit-2: Ecosystem	6	Dr. Sutapa Ray	
3	Unit-3: Natural Resources: Renewable and Non-renewable resources	8	Dr. Sutapa Ray	
4	Unit-4: Biodiversity and conservation	8	Dr. Sutapa Ray	
5	Unit-5: Environmental Pollution	8	Dr. Soumya Sundar Mati	
6	Unit-6: Environmental Policies and Practices	7	Dr. Soumya Sundar Mati	
7	Unit-7: Human Communities and the Environment	6	Dr. Soumya Sundar Mati	
8	Unit-8: Field work	5	Dr. Soumya Sundar Mati & Dr. Sutapa Ray	

**CURRICULUM PLAN (Full year)
(Chemistry General; 3T B.Sc)**

3 rd year (AY 2018-2019)		Period: 16.07.2018 to 15.03.2019		
Paper: 3TG (Theory)		Full Marks: 50		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Chemistry Group -A: Applied Chemistry Chemical separation process, Amino acids, peptide and proteins, Nucleic acids, Drug, Synthesis of dye and use & Hydrogenation of oil	30	Dr. Sutapa Ray	
2	Chemistry Group -A: Applied Chemistry Manufacturing of some important Industrial Products, Petroleum, Pesticides, Food Additives & Error analysis	30	Dr. Soumya Sundar Mati	

3 rd year (AY 2018-2019)		Period: 16.07.2018 to 15.03.2019		
Paper: 3TG (Practical)		Full Marks: 50		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Group -B: Practical Chemistry	60	Dr. Soumya Sundar Mati & Dr. Sutapa Ray	

(ENVS Compulsory)

3 rd year (AY 2018-2019)		Period: 16.07.2018 to 15.03.2019		
Paper: ENVS (Compulsory) (Theory)		Full Marks: 70(T)+ 30(P)		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: The Multidisciplinary nature of environmental studies	5	Dr. Soumya Sundar Mati	
2	Unit 2: Natural resources: Renewable and non-renewable resources	5	Dr. Sutapa Ray	
3	Unit 3: Ecology and Ecosystems	5	Dr. Sutapa Ray	
4	Unit 4: Biodiversity and its conservation	5	Dr. Sutapa Ray	
5	Unit 5 :Environmental Degradation and Pollution	5	Dr. Sutapa Ray	
6	Unit-6: Social Issues and the Environment	15	Dr. Soumya Sundar Mati	
7	Unit-7: Human Population and the Environment	10	Dr. Soumya Sundar Mati	
8	Unit-8: Field Work Report I Project Report I Term Paper	5	Dr. Soumya Sundar Mati & Dr. Sutapa Ray	

CURRICULUM PLAN(ODD SEMESTER)
(Chemistry GE; CBCS)

Semester I (AY 2018-2019)		Period: 18.07.2018 to 16.11.2018		
Paper: GE1T (Theory)		Full Marks: 40(T)+10(IA)+5(CA)		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<u>Section B: Organic Chemistry</u> Fundamentals of Organic Chemistry, Stereo Chemistry, Nucleophilic substitution and Elimination reactions, Aliphatic Hydrocarbons	30	Dr. Sutapa Ray	
2	<u>Section A: Inorganic Chemistry</u> Atomic Structure, Chemical Periodicity, Acid and Bases, Redox Reactions	30	Dr. Soumya Sundar Mati	

Semester I (AY 2018-2019)		Period: 18.07.2018 to 16.11.2018		
Paper: GE1P (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Atomic Structure, Chemical Periodicity, Acid and Bases, Redox Reactions, General Organic Chemistry and Aliphatic Hydrocarbon	60	Dr. Soumya Sundar Mati & Dr. Sutapa Ray	

**CURRICULUM PLAN(EVEN SEMESTER)
(Chemistry GE; CBCS)**

Semester II (AY 2018-2019)		Period: 31.01.2019 to 31.5.2019		
Paper: GE2 (Theory)		Full Marks: 40(T)+10(IA)+5(CA)		Credit: 04
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Section A: Physical Chemistry-I Kinetic Theory of Gases and Real gases, Liquids, Solids, Chemical Kinetics	30	Dr. Soumya Sundar Mati	
2	Section B: Inorganic Chemistry-II Chemical Bonding and Molecular Structure, Comparative study of p-block elements	30	Dr. Sutapa Ray	

Semester II (AY 2018-2019)		Period: 31.01.2019 to 31.5.2019		
Paper: GE2P (Practical)		Full Marks: 20		Credit: 02
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	STATES OF MATTER & CHEMICAL KINETICS, CHEMICAL BONDING & MOLECULAR STRUCTURE, p-BLOCK ELEMENTS	60	Dr. Soumya Sundar Mati & Dr. Sutapa Ray	

(ENVS AECC; CBCS)

Semester II (AY 2018-2019)		Period: 31.01.2019 to 31.5.2019		
Paper: ENVS (AECC) (Theory)		Full Marks: 50(T)+15(IA)+5(CA)+30(P)		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit-1: Introduction to environmental studies	2	Dr. Soumya Sundar Mati	
2	Unit-2: Ecosystem	6	Dr. Sutapa Ray	
3	Unit-3: Natural Resources: Renewable and Non-renewable resources	8	Dr. Sutapa Ray	
4	Unit-4: Biodiversity and conservation	8	Dr. Sutapa Ray	
5	Unit-5: Environmental Pollution	8	Dr. Soumya Sundar Mati	
6	Unit-6:Environmental Policies and Practices	7	Dr. Soumya Sundar Mati	
7	Unit-7: Human Communities and the Environment	6	Dr. Soumya Sundar Mati	
8	Unit-8: Field work	5	Dr. Soumya Sundar Mati & Dr. Sutapa Ray	

Curriculum Plan (EVEN SEMESTER)

Semester II

(Zoology Honours; CBCS)

Semester II (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC 3T (Non- Chordates-II) (Theory)		Full Marks: 55		Credit:4
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Evolution of coelom and metamerism	2	DEBARSHI MONDAL	
	Unit 2: Annelida General characteristics and Classification up to classes Excretion in Annelida through nephridia. Metamerism in Annelida.	10	DEBARSHI MONDAL	
	Unit 3: Arthropoda General characteristics and Classification up to classes Vision in Insecta only. Respiration in Arthropoda (Gills in prawn and trachea in cockroach) Metamorphosis in Lepidopteran Insects. Social life in termite	16	DEBARSHI MONDAL	
	Unit 4: Onychophora General characteristics and Evolutionary significance	2	DEBARSHI MONDAL	
	Unit 5: Mollusca General characteristics and Classification up to classes Nervous system and torsion in Gastropoda Feeding and respiration in <i>Pila</i> sp	10	DEBARSHI MONDAL	
	Unit 6: Echinodermata General characteristics and Classification up to classes Water-vascular system in Asteroidea Larval forms in Echinodermata Affinities with Chordates	8	DEBARSHI MONDAL	
	Unit 7: Hemichordata General characteristics of phylum Hemichordata. Relationship with non-chordates and chordates	2	DEBARSHI MONDAL	

Semester II (AY 2023-2024)		Period:Feb,2023 to July,2023		
Paper: CC 3P (Non- Chordates-II) (Practical)		Full Marks: 20		Credit:2
Sl. No.	Paper/Topic	CLASSES ALLOTTED	Class taken by	Remark
1	<p>1. Study of following specimens:</p> <p>a. Annelids - <i>Aphrodite</i>, <i>Nereis</i>, <i>Heteronereis</i>, <i>Sabella</i>, <i>Serpula</i>, <i>Chaetopterus</i>, <i>Pheretima</i>, <i>Hirudinaria</i></p> <p>b. Arthropods - <i>Limulus</i>, <i>Palamnaeus</i>, <i>Palaemon</i>, <i>Daphnia</i>, <i>Balanus</i>, <i>Sacculina</i>, <i>Cancer</i>, <i>Eupagurus</i>, <i>Scolopendra</i>, <i>Julus</i>, <i>Bombyx</i>, <i>Periplaneta</i>, termites and honey bees <i>Onychophora</i> - <i>Peripatus</i></p> <p>c. Molluscs - <i>Chiton</i>, <i>Dentalium</i>, <i>Pila</i>, <i>Doris</i>, <i>Helix</i>, <i>Unio</i>, <i>Ostrea</i>, <i>Pinctada</i>, <i>Sepia</i>, <i>Octopus</i>, <i>Nautilus</i></p> <p>d. Echinodermates - <i>Pentaceros/Asterias</i>, <i>Ophiura</i>, <i>Clypeaster</i>, <i>Echinus</i>, <i>Cucumaria</i> and</p> <p>e. <i>Antedon</i></p>	6	DEBARSHI MONDAL	
2	2. Study of digestive system, septal nephridia and pharyngeal nephridia of earthworm	3	DEBARSHI MONDAL	
3	3. T.S. through pharynx, gizzard, and typhlosolar intestine of earthworm	2	Dr. Sudipta Chakraborty	
4	4. Mount of mouth parts and dissection of digestive system and nervous system of <i>Periplaneta</i> *	2	Dr. Sudipta Chakraborty	
5	5. To submit a Project Report on any related topic to larval forms (crustacean, mollusc and echinoderm)	3	DEBARSHI MONDAL	

Semester II (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC 4T (Cell Biology) (Theory)		Full Marks: 55 Credit:4		
Sl. No.	Paper/Topic	CLASSE S ALLOTE D	Class taken by	Remark
1	Unit 1: Overview of Cells Basic structure of Prokaryotic and Eukaryotic cells, Viruses, Viroid, Prion and Mycoplasma	2 2	Dr. MANIDIP SHASMAL	
2	Unit 2: Plasma Membrane Ultra structure and composition of Plasma membrane: Fluid mosaic model Transport across membrane: Active and Passive transport, Facilitated transport Cell junctions: Tight junctions, Gap junctions, Desmosomes	6	Dr. MANIDIP SHASMAL	
3	Unit 3: Cytoplasmic organelles I Structure and Functions: Endoplasmic Reticulum, Golgi Apparatus, Lysosomes Protein sorting and mechanisms of vesicular transport	5	Dr. MANIDIP SHASMAL	
4	Unit 4: Cytoplasmic organelles II Mitochondria: Structure, Semi-autonomous nature, Endosymbiotic hypothesis Mitochondria Peroxisomes: Structure and Functions Centrosome: Structure and Functions	6	Dr. MANIDIP SHASMAL	
5	Unit 5: Cytoskeleton Type, structure and functions of cytoskeleton Accessory proteins of microfilament & microtu A brief idea about molecular motors	5	Dr. MANIDIP SHASMAL	
6	Unit 6: Nucleus Structure of Nucleus: Nuclear envelope, Nuclear pore complex, Nucleolus Chromatin: Euchromatin and Hetrochromatin and packaging (nucleosome)	8 8	Dr. MANIDIP SHASMAL	

7	Unit 7: Cell Division Cell cycle and its regulation, Cancer (Concept of oncogenes and tumor suppressor genes with special reference to p53 Retinoblastoma and Ras and APC. Mitosis and Meiosis: Basic process and their significance	10	Dr. Sudipta Chakraborty	
8	Unit 8: Cell Signaling Cell signalling transduction pathways; Types of signaling molecules and receptors GPCR and Role of second messenger (cAMP) Extracellular matrix-Cell interactions Apoptosis and Necrosis	8	Dr. Sudipta Chakraborty	

Semester II (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC 4P (Cell Biology) (Practical)		Full Marks: 20 Credit:2		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Preparation of temporary stained squash of onion root tip to study various stages of mitosis	4	Dr. MANIDIP SHASMAL	
2	2. Study of various stages of meiosis.	4	DEBARSHI MONDAL	
3	3. Preparation of permanent slide to show the presence of Barr body in human female blood cells/cheek cells.	4	DEBARSHI MONDAL	
4	4. Preparation of permanent slide to demonstrate: a. DNA by Feulgen reaction b. Cell viability study by Trypan Blue staining c. Mitochondria identification through vital staining	4	Dr. MANIDIP SHASMAL	

Curriculum Plan (EVEN SEMESTER)**Semester IV****(Zoology Honours; CBCS)**

Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC8T (Comparative Anatomy of Vertebrates) (Theory)		Full Marks:55 Credit:4		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Integumentary System Structure, function and derivatives of integument in amphibian, birds and mammals	6	DEBARSHI MONDAL	
2	Unit 2: Skeletal System Overview of axial and appendicular skeleton; Jaw suspension; Visceral arches.	6	DEBARSHI MONDAL	
3	Unit 3: Digestive System Comparative anatomy of stomach; dentition in mammals	6	DEBARSHI MONDAL	
4	Unit 4: Respiratory System Respiratory organs in fish, amphibian, birds and mammals	6	DEBARSHI MONDAL	
5	Unit 5: Circulatory System General plan of circulation, Comparative account of heart and aortic arches	6	DEBARSHI MONDAL	
6	Unit 6: Urinogenital System Succession of kidney, Evolution of urinogenital ducts, Types of mammalian uteri	6	DEBARSHI MONDAL	
7	Unit 7: Nervous System Comparative account of brain, Cranial nerves in mammals	8	Dr. MANIDIP SHASMAL	
8	Unit 8: Sense Organs Classification of receptors, Brief account of olfactory and auditory receptors in vertebrate	6	Dr. MANIDIP SHASMAL	

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Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC8P (Comparative Anatomy of Vertebrates) (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of placoid, cycloid and ctenoid scales through permanent slides/photographs.	3	DEBARSHI MONDAL	
2	2. Study of disarticulated skeleton of Toad, Pigeon and Guineapig.	4	DEBARSHI MONDAL	
3	3. Demonstration of Carapace and plastron of turtle.	3	DEBARSHI MONDAL	
4	4. Identification of mammalian skulls: One herbivorous (Guineapig) and one carnivorous (Dog) animal.	3	Dr. Sudipta Chakraborty	
5	5. Dissection of Tilapia: Circulatory system, Brain, pituitary, urinogenital system.	3	Dr. Sudipta Chakraborty	

Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC9T (Animal Physiology: Life Sustaining Systems) (Theory)		Full Marks: 55		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Physiology of Digestion	8	DEBARSHI	

	Structural organisation and functions of Gastrointestinal tract and Associated glands; Mechanical and chemical digestion of food, absorption of Carbohydrates, Lipids, Proteins and Nucleic Acids; Digestive enzymes		MONDAL	
2	Unit 2: Physiology of Respiration Mechanism of Respiration, Respiratory volumes and capacities, transport of Oxygen and Carbon dioxide in blood, Dissociation curves and the factors influencing it, respiratory pigments; Carbon monoxide poisoning	10	DEBARSHI MONDAL	
3	Unit 3: Physiology of Circulation Components of Blood and their functions; Structure and functions of haemoglobin Haemostasis; Blood clotting system, Fibrinolytic system Haemopoiesis; Basic steps and its regulation Blood groups; ABO and Rh factor	8	DEBARSHI MONDAL	
4	Unit 4: Physiology of Heart Structure of mammalian heart, Coronary Circulation, Structure and working of conducting myocardial fibres, Origin and conduction of cardiac impulses Cardiac Cycle and cardiac output Blood pressure and its regulation	8	DEBARSHI MONDAL	
5	Unit 5: Thermoregulation & Osmoregulation Physiological classification based on thermal biology. Thermal biology of endotherms Osmoregulation in aquatic vertebrates Extrarenal osmoregulatory organs in vertebrates	8	Dr. MANIDIP SHASMAL	
6	Unit 6: Renal Physiology Structure of Kidney and its functional unit, Mechanism of urine formation, Regulation of acid-base balance	8	Dr. MANIDIP SHASMAL	

Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC9P (Animal Physiology: Life Sustaining Systems) (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Determination of ABO Blood group	3	DEBARSHI MONDAL	
2	2. Enumeration of red blood cells and white blood cells using haemocytometer	4	Dr. MANIDIP SHASMAL	
3	3. Estimation of haemoglobin using Sahli's haemoglobinometer	3	DEBARSHI MONDAL	
4	4. Preparation of haemin and haemochromogen crystals	3	Dr. MANIDIP SHASMAL	
5	5. Recording of blood pressure using a sphygmomanometer	3	Dr. MANIDIP SHASMAL	

Semester IV (AY 2023-2024)		Period: Period: Feb,2023 to July,2023		
Paper: CC10T (Immunology) (Theory)		Full Marks: 55		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Overview of Immune System Basic concepts of health and diseases, Historical perspective of Immunology, Cells and organs of the Immune system	4	Dr. Sudipta Chakraborty	
2	Unit 2: Innate and Adaptive Immunity Anatomical barriers, Inflammation, Cell and molecules involved in innate immunity, Adaptive immunity (Cell mediated and humoral).	5	Dr. Sudipta Chakraborty	
3	Unit 3: Antigens Antigenicity and immunogenicity, Immunogens, Adjuvants and haptens, Factors influencing immunogenicity, B and T-Cell epitopes	4	Dr. Sudipta Chakraborty	
4	Unit 4: Immunoglobulins Structure and functions of different classes of immunoglobulins, Antigen- antibody interactions, Immunoassays (ELISA and RIA), Hybridoma technology, Monoclonal antibody production	8	Dr. Sudipta Chakraborty	
5	Unit 5: Major Histocompatibility Complex Structure and functions of MHC molecules. Structure of T cell Receptor and its signalling, T cell development & selection	6	Dr. Sudipta Chakraborty	
6	Unit 6: Cytokines Types, properties and functions of cytokines.	5	Dr. MANIDIP SHASMAL	

7	Unit 7: Complement System Components and pathways of complement activation.	5	Dr. MANIDIP SHASMAL	
8	Unit 8: Hypersensitivity Gell and Coombs' classification and brief description of various types of hypersensitivities.	5	Dr. MANIDIP SHASMAL	
9	Unit 9: Immunology of diseases Malaria, Filariasis, Dengue and Tuberculosis	4	Dr. MANIDIP SHASMAL	
10	Unit 10: Vaccines Various types of vaccines. Active & passive immunization (Artificial and natural).	4	Dr. MANIDIP SHASMAL	

Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC10P (Immunology) (Practical)		Full Marks: 20		Credit:2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Demonstration of lymphoid organs.	3	Dr. MANIDIP SHASMAL	
2	2. Histological study of spleen, thymus and lymph nodes through slides/ photographs	4	DEBARSHI MONDAL	
3	3. Preparation of stained blood film to study various types of blood cells.	4	Dr. MANIDIP SHASMAL	
4	4. ABO blood group determination.	3	Dr. MANIDIP SHASMAL	
5	5. Demonstration of ELISA	2	Dr. MANIDIP SHASMAL	

Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: SEC2T (Sericulture) (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Sericulture: Definition, history and present status; Silk route Types of silkworms, Distribution and Races Exotic and indigenous races Mulberry and non-mulberry Sericulture	10	DEBARSHI MONDAL	
2	Unit 2: Biology of Silkworm Life cycle of <i>Bombyx mori</i> Structure of silk gland and secretion of silk	8	DEBARSHI MONDAL	
3	Unit 3: Rearing of Silkworms Selection of mulberry variety and establishment of mulberry garden Rearing house and rearing appliances. Disinfectants: Formalin, bleaching powder, RKO Silkworm rearing technology: Early age and Late age rearing Types of mountages Spinning, harvesting and storage of cocoons	12	DEBARSHI MONDAL	
4	Unit 4: Pests and Diseases Pests of silkworm: Uzi fly, dermestid beetles and vertebrates Pathogenesis of silkworm diseases: Protozoan, viral, fungal and bacterial Control and prevention of pests and diseases	12	Dr. Sudipta Chakraborty	
5	Unit 5: Entrepreneurship in Sericulture Prospectus of Sericulture in India: Sericulture industry in different states, employment, potential in mulberry and non-mulberry sericulture Visit to various	8	Dr. MANIDIP SHASMAL	

	sericulture centres.			
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**Curriculum Plan (EVEN SEMESTER)
(Zoology GENERAL; CBCS)**

Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: GE4T (Environment and Public Health) (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Sources of Environmental hazards, Hazard identification and accounting, Fate of toxic and persistent substances in the environment, Dose response evaluation, Exposure assessment.	10	Dr. Sudipta Chakraborty	
2	Unit 2: Climate Change Greenhouse gases and global warming, Acid rain, Ozone layer destruction, Effect of climate change on public health	10	Dr. MANIDIP SHASMAL	
3	Unit 3: Pollution Air, water, noise pollution sources and effects, Pollution control.	10	DEBARSHI MONDAL	
4	Unit 4: Waste Management Technologies Sources of waste, types and characteristics, Sewage disposal and its management, Solid waste disposal, Biomedical waste handling and disposal, Nuclear waste handling and disposal, Waste from thermal power plants.	10	DEBARSHI MONDAL	
5	Unit 5: Diseases Causes, symptoms and control of tuberculosis, Asthma, Cholera, Minamata disease, typhoid, filariasis	10	DEBARSHI MONDAL	

Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: GE4P (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	To determine pH, Cl, SO ₄ , NO ₃ in soil and water samples from different locations.	16	Dr. Sudipta Chakraborty	

Curriculum Plan (EVEN SEMESTER)
Semester VI
(Zoology Honours; CBCS)

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC13T (Developmental Biology) (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Basic concepts: Phases of Development, Cell cell interaction, Differentiation and growth, Differential gene expression.	8	DEBARSHI MONDAL	
2	Unit 2: Early Embryonic Development Gametogenesis, Spermatogenesis, Oogenesis; Types of eggs, Egg membranes; Fertilization (External and Internal): Changes in gametes, Blocks to polyspermy; Planes and patterns of cleavage; Types of Blastula; Fate maps (including Techniques); Early development of frog and chick up to gastrulation; Embryonic induction and organizers.	12	DEBARSHI MONDAL	
3	Unit 3: Late Embryonic Development Fate of Germ Layers; Extra-embryonic membranes in birds; Implantation of embryo in humans, Placenta (Structure, types and functions of placenta).	10	Dr. Sudipta Chakraborty	
4	Unit 4: Post Embryonic Development Development of brain and Eye in Vertebrate. Regeneration: Modes of regeneration, epimorphosis, morphallaxis and compensatory regeneration (with one example each).	10	Dr. MANIDIP SHASMAL	
5	Unit 5: Implications of Developmental Biology 8 Class	10	Dr. MANIDIP SHASMAL	

	Teratogenesis: Teratogenic agents and their effects on embryonic development; In vitro fertilization, Stem cell (ESC), Amniocentesis.			
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Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC13P (Developmental Biology) (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTE D	Class taken by	Remark
1	1. Study of whole mounts of developmental stages of chick through permanent slides: Primitive streak (13 and 18 hours), 21, 24, 28, 33, 36, 48, 72, and 96 hours of incubation (Hamilton and Hamburger stages).	6	Dr. Sudipta Chakraborty	
2	2. Study of the developmental stages and life cycle of Drosophila from stock culture.	4	Dr. MANIDIP SHASMAL	
3	3. Study of different sections of placenta (photomicrograph/ slides).	3	DEBARSHI MONDAL	
4	4. Project report on Drosophila culture/chick embryo development.	3	Dr. MANIDIP SHASMAL	

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC14T (Evolutionary Biology) (Theory)		Full Marks: 55		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit-1: Life's Beginnings: Chemogeny, RNA world, Biogeny, Origin of photosynthesis, evolution of eukaryotes.	4	Dr. Sudipta Chakraborty	
2	Unit-2: Historical review of Evolutionary concepts, Lamarkism, Darwinism and Neo Darwinism.	6	Dr. Sudipta Chakraborty	
3	Unit-3: Geological time scale, Fossil records of Hominids (from <i>Australopithacus</i> to <i>Homo sapiens</i>), evolution of horse. Neutral theory of molecular evolution, Molecular clock.	5	Dr. Sudipta Chakraborty	
4	Unit-4: Sources of variations: Heritable variations and their role in evolution.	5	Dr. MANIDIP SHASMAL	
5	Unit-5: Population genetics: Hardy-Weinberg Law (statement and derivation of equation, application Of law to biallelic Population); Evolutionary forces upsetting H-W equilibrium; Natural selection (concept of fitness, types of selection, selection coefficient, mode of selection heterozygous superiority).Genetic Drift mechanism (founder's effect, bottleneck phenomenon). Role of Migration and Mutation in changing allele frequencies.	8	Dr. MANIDIP SHASMAL	
6	Unit-6: Species concept, Isolating mechanisms, modes of speciation. Adaptive radiation /macroevolution (exemplified by Galapagos finches).	4	Dr. MANIDIP SHASMAL	
7	Unit-7: Extinctions, Back ground and mass extinctions (causes and effects), detailed	5	Dr. MANIDIP	

	example of K-T extinction.		SHASMAL	
8	Unit-8: Origin and Evolution of Man, Unique Hominin characteristics contrasted with primate characteristic Molecular analysis of human origin.	6	Dr. Sudipta Chakraborty	
9	Unit-9: Phylogenetic trees, Construction & interpretation of Phylogenetic tree using parsimony, Convergent & Divergent evolution.	7	Dr. Sudipta Chakraborty	

Semester V (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: CC14P (Evolutionary Biology) (Practical)		Full Marks: 20		Credit:2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of fossils from models/pictures	4	DEBARSHI MONDAL	
2	2. Study of homology and analogy from suitable specimens	4	DEBARSHI MONDAL	
3	3. Study and verification of Hardy-Weinberg Law by chi square analysis	4	Dr. MANIDIP SHASMAL	
4	4. Graphical representation and interpretation of data of height/weight of a sample of 100 humans in relation to their age and sex.	4	Dr. MANIDIP SHASMAL	

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE3 (Parasitology) (Theory)		Full Marks: 55		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit-1: Introduction to Parasitology Brief introduction of Parasitism, Parasite, Parasitoid and Vectors (mechanical and biological vector Host parasite relationship)	6	Dr. Sudipta Chakraborty	
2	Unit-2: Parasitic Protists Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of <i>Giardia intestinalis</i> , <i>Trypanosoma gambiense</i> , <i>Leishmania donovani</i>	12	Dr. Sudipta Chakraborty	
3	Unit-3: Parasitic Platyhelminthes Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of <i>Schistosoma haematobium</i> , <i>Taenia sajinata</i>	8	Dr. Sudipta Chakraborty	
4	Unit-4: Parasitic Nematodes Study of Morphology, Life Cycle, Prevalence, Epidemiology, Pathogenicity, Diagnosis, Prophylaxis and Treatment of <i>Ascaris lumbricoides</i> , <i>Ancylostoma duodenale</i> , <i>Wuchereria bancrofti</i> and <i>Trichinella spiralis</i> , <i>Brugia malayi</i> ; Nematode plant interaction; Gall formation.	11	Dr. MANIDIP SHASMAL	
5	Unit-5: Parasitic Arthropods Biology, importance and control of ticks (Soft tick <i>Ornithodoros</i> , Hard tick <i>Ixodes</i>), mites (<i>Sarcoptes</i>), Lice (<i>Pediculus</i>), Flea (<i>Xenopsylla</i>) and Bug (<i>Cimex</i>).	7	Dr. Sudipta Chakraborty	
6	Unit-6: Parasite Vertebrates Brief account of Cookicutter Shark, Hood Mocking bird, Vampire bat.	6	Dr. Sudipta Chakraborty	

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE3 (Parasitology) (Practical)		Full Marks: 20		Credit:2

Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of life stages of <i>Giardia intestinalis</i> , <i>Trypanosoma gambiense</i> , <i>Leishmania donovani</i> through permanent slides/micro photographs.	3	DEBARSHI MONDAL	
2	2. Study of adult and life stages of <i>Schistosoma haematobium</i> , <i>Taenia sajinata</i> through permanent slides/micro photographs.	2	Dr. Sudipta Chakraborty	
3	3. Study of adult and life stages of <i>Ancylostoma duodenale</i> , <i>Brugia malayi</i> and <i>Trichinella spiralis</i> through permanent slides/micro photographs.	2	Dr. Sudipta Chakraborty	
4	4. Study of plant parasitic root knot nematode, Meloidogyne from the soil sample.	2	Dr. Sudipta Chakraborty	
5	5. Study of <i>Pediculus humanus</i> , <i>Xenopsylla cheopis</i> and <i>Cimex lectularius</i> through permanent slides/ photographs.	2	Dr. Sudipta Chakraborty	
6	6. Study of monogenea from the gills of fresh/marine fish [Gills can be procured from fish market as by product of the industry].	2	Dr. Sudipta Chakraborty	
7	7. Study of nematode/cestode parasites from the intestines of Poultry bird [Intestine can be procured from poultry/market as a by-product. Submission of a brief report on parasitic vertebrates.	3	Dr. Sudipta Chakraborty	

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE4 (Wild Life Conservation and Management) (Theory)		Full Marks: 55		Credit:4
Sl.	TOPICS	CLASSES	Class taken	Remark

No.		ALLOTTED	by	
1	Unit-1: Introduction to Wild Life Values of wild life - positive and negative; Conservation ethics; Importance of conservation; Causes of depletion; World conservation strategies.	5	Dr. Sudipta Chakraborty	
2	Unit-2: Evaluation and management of wild life Habitat analysis, Physical parameters: Topography, Geology, Soil and water Biological Parameters: food, cover, forage, browse and cover estimation. Standard evaluation procedures: remote sensing and GIS.	6	Dr. Sudipta Chakraborty	
3	Unit-3: Management of habitats Setting back succession; Grazing logging; Mechanical treatment; Advancing the successional process; Cover construction; Preservation of general genetic diversity Restoration of degraded habitats.	6	Dr. Sudipta Chakraborty	
4	Unit-4: Population estimation Population density, Natality, Birth rate, Mortality, fertility schedules and sex ratio computation; Faecal analysis of ungulates and carnivores; Pug marks and census method.	6	Dr. MANIDIP SHASMAL	
5	Unit-5: Aims and objectives of wildlife conservation Wildlife conservation in India – through ages; different approaches of wildlife conservation; modes of conservation; in-situ conservation and ex-situ conservation: necessity for wildlife conservation.	8	DEBARSHI MONDAL	
6	Unit-6: Management planning of wild life in protected areas Estimation of carrying capacity; Eco tourism / wild life tourism in forests; Concept of climax persistence; Ecology of perturbation.	8	Dr. MANIDIP SHASMAL	
7	Unit-7: Man and Wildlife Causes and consequences of human-wildlife conflicts; mitigation of conflict – an overview; Management of excess population.	5	Dr. MANIDIP SHASMAL	
8	Unit-8: Protected areas National parks & sanctuaries, Community reserve; Important features of protected	6	DEBARSHI MONDAL	

	areas in India; Tiger conservation - Tiger reserves in India; Management challenges in Tiger reserve.			
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Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE4 (Wild Life Conservation and Management) (Practical)		Full Marks: 20		Credit:2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	List of Practical 1. Identification of flora, mammalian fauna, avian fauna, herpeto-fauna.	3	DEBARSHI MONDAL	
2	2. Demonstration of basic equipment needed in wildlife studies use, care and maintenance (Compass, Binoculars, Spotting scope, Range Finders, Global Positioning System, Various types of Cameras and lenses).	3	DEBARSHI MONDAL	
3	3. Familiarization and study of animal evidences in the field; Identification of animals through pug marks, hoof marks, scats, pellet groups, nest, antlers, etc.	3	Dr. MANIDIP SHASMAL	
4	4. Demonstration of different field techniques for flora and fauna.	2	Dr. MANIDIP SHASMAL	
5	5. PCQ, ten tree method, Circular, Square & rectangular plots, Parker's 2 Step and other methods for ground cover assessment, Tree canopy cover assessment, Shrub cover assessment.	3	Dr. Sudipta Chakraborty	
6	6. Trail / transect monitoring for abundance and diversity estimation of mammals and bird (direct and indirect evidences).	2	Dr. Sudipta Chakraborty	

Curriculum Plan (ODD SEMESTER)

Semester I

(Zoology Hons; CBCS)

Semester I (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: CC-1: Non-Chordates I (Theory)		Full Marks:55		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	<p>Unit 1: Basics of Animal Classification</p> <p>Definitions: Classification, Systematics and Taxonomy; Taxonomic Hierarchy, Taxonomic types</p> <p>Codes of Zoological Nomenclature; Principle of priority; Synonymy and Homonymy; Six kingdom</p> <p>concept of classification (Card woese)</p>	4	DEBARSHI MONDAL	
2	<p>Unit 2: Protista and Metazoa</p> <p>Protozoa</p> <p>General characteristics and Classification up to phylum (according to Levine et. al., 1981) Locomotion</p> <p>in <i>Euglena</i>, <i>Paramoecium</i> and <i>Amoeba</i>; Conjugation in <i>Paramoecium</i>.</p> <p>Life cycle and pathogenicity of <i>Plasmodium vivax</i> and <i>Entamoeba histolytica</i></p> <p>Metazoa</p> <p>Evolution of symmetry and segmentation of Metazoa</p>	15	DEBARSHI MONDAL	
3	<p>Unit 3: Porifera</p> <p>General characteristics and Classification up to classes; Canal system and spicules in sponges</p>	6	DEBARSHI MONDAL	
4	<p>Unit 4: Cnidaria</p> <p>General characteristics and Classification up to classes Metagenesis in <i>Obelia</i> & <i>Aurelia</i></p> <p>Metagenesis in <i>Obelia</i></p> <p>Polymorphism in Cnidaria</p> <p>Corals and coral reef diversity, function & conservation</p>	10	Dr. SUDIPTA CHAKRABORTY	
5	<p>Unit 5: Ctenophora</p> <p>General characteristics</p>	2	Dr. SUDIPTA CHAKRABORTY	
6	<p>Unit 6: Platyhelminthes</p>	6	Dr. SUDIPTA	

	General characteristics and Classification up to classes Life cycle and pathogenicity and control measures of <i>Fasciola hepatica</i> and <i>Taenia solium</i>		CHAKRABORTY	
7	Unit 7: Nematoda General characteristics and Classification up to classes Life cycle, and pathogenicity and control measures of <i>Ascaris lumbricoides</i> and <i>Wuchereria bancrofti</i> Parasitic adaptations in helminthes	7	Dr. MANIDIP SHASMAL	

Semester I (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: C1 P1 –Non-Chordates I (Practical)		Full Marks: 20		Credit:2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of whole mount of <i>Euglena</i> , <i>Amoeba</i> and <i>Paramecium</i>	3	DEBARSHI MONDAL	
2	2. Identification of <i>Amoeba</i> , <i>Euglena</i> , <i>Entamoeba</i> , <i>Opalina</i> , <i>Paramecium</i> , <i>Plasmodium vivax</i> and <i>Plasmodium falciparum</i> (from the prepared slides)	4	DEBARSHI MONDAL	
3	3. Identification of <i>Sycon</i> , Neptune's Cup, <i>Obelia</i> , <i>Physalia</i> , <i>Millepora</i> , <i>Aurelia</i> , <i>Tubipora</i> , <i>Corallium</i> , <i>Alcyonium</i> , <i>Gorgonia</i> , <i>Metridium</i> , <i>Pennatula</i> , <i>Fungia</i> , <i>Meandrina</i> , <i>Madrepora</i>	3	DEBARSHI MONDAL	
4	4. Identification and significance of adult <i>Fasciola hepatica</i> , <i>Taenia solium</i> and <i>Ascaris lumbricoides</i>	3	Dr. MANIDIP SHASMAL	
5	5. Staining/mounting of any protozoa/helminth from gut of cockroach	3	Dr. SUDIPTA CHAKRABORTY	

Semester I (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: C2 T–Ecology (Theory)		Full Marks:55		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to Ecology History of ecology, Autecology and synecology, Levels of organization, Laws of limiting factors, Study of Physical factors, The Biosphere	4	Dr. MANIDIP SHASMAL	

2	<p>Unit 2: Population</p> <p>Unitary and Modular populations</p> <p>Unique and group attributes of population: Demographic factors, life tables, fecundity tables,</p> <p>survivorship curves, dispersal and dispersion.</p> <p>Geometric, exponential and logistic growth, equation and patterns, r and K strategies Population</p> <p>regulation - density-dependent and independent factors</p> <p>Population Interactions, Gause's Principle with laboratory and field examples, Lotka-Volterra equation</p> <p>for competition.</p>	20	Dr. MANIDIP SHASMAL	
3	<p>Unit 3: Community</p> <p>Community characteristics: species diversity, abundance, , dominance, richness,</p> <p>Vertical stratification, Ecotone and edge effect. Ecological succession with one example</p>	11	Dr. SUDIPTA CHAKRABORTY	
4	<p>Unit 4: Ecosystem</p> <p>Types of ecosystem with an example in detail, Food chain: Detritus and grazing food chains,</p> <p>Linear</p> <p>and Y-shaped food chains, Food web, Energy flow through the ecosystem, Ecological pyramids and</p> <p>Ecological efficiencies</p> <p>Nutrient and biogeochemical cycle with an example of Nitrogen cycle</p> <p>Human modified ecosystem</p>	10	DEBARSHI MONDAL	
5	<p>Unit 5: Applied Ecology</p> <p>Wildlife Conservation (in-situ and ex-situ conservation).</p> <p>Management strategies for tiger conservation; Wild life protection act (1972)</p>	5	DEBARSHI MONDAL	

Semester I (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: C2 P –Ecology Lab (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of life tables and plotting of survivorship curves of different types from the hypothetical/real data provided	4	DEBARSHI MONDAL	
2	2. Determination of population density in a natural/hypothetical community by quadrat method and calculation of Shannon-Weiner diversity index for the same community	5	Dr. MANIDIP SHASMAL	
3	3. Study of an aquatic ecosystem: Phytoplankton and zooplankton, Measurement of area, temperature, turbidity/penetration of light, determination of pH, and Dissolved Oxygen content (Winkler's method), Chemical Oxygen Demand and free CO ₂	6	Dr. SUDIPTA CHAKRABORTY	
4	4. Report on a visit to National Park/Biodiversity Park/Wild life sanctuary	1	Dr. SUDIPTA CHAKRABORTY	

Curriculum Plan (ODD SEMESTER)
Semester III
(Zoology Honours; CBCS)

Semester III (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: CC-5: Chordates (Theory)		Full Marks:55		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to Chordates General characteristics and outline classification of Phylum Chordata	5	DEBARSHI MONDAL	
2	Unit 2: Protochordata General characteristics and classification of sub-phylum Urochordata and	5	DEBARSHI MONDAL	

	Cephalochordata up to Classes. Retrogressive metamorphosis in <i>Ascidia</i> . Chordate Features and Feeding in <i>Branchiostoma</i>			
3	Unit 3: Origin of Chordata Dipleurula concept and the Echinoderm theory of origin of chordates Advanced features of vertebrates over Protochordata	5	DEBARSHI MONDAL	
4	Unit 4: Agnatha General characteristics and classification of cyclostomes up to order	4	DEBARSHI MONDAL	
5	Unit 5: Pisces General characteristics and classification of Chondrichthyes and Osteichthyes up to Subclasses Accessory respiratory organ, migration and parental care in fishes Swim bladder in fishes. Classification up to Sub-Classes	6	DEBARSHI MONDAL	
6	Unit 6: Amphibia General characteristics and classification up to living Orders. Metamorphosis and parental care in Amphibia	5	DEBARSHI MONDAL	
7	Unit 7: Reptilia General characteristics and classification up to living Orders. Poison apparatus and Biting mechanism in Snake	5	Dr. MANIDIP SHASMAL	
8	Unit 8: Aves General characteristics and classification up to Sub-Classes Exoskeleton and migration in Birds Principles and aerodynamics of flight	5	Dr. MANIDIP SHASMAL	
9	Unit 9: Mammals General characters and classification up to living orders Affinities of Prototheria Exoskeleton derivatives of mammals Adaptive radiation in mammals with reference to locomotory appendages Echolocation in Micro chiropterans and Cetaceans	6	Dr. SUDIPTA CHAKRABORTY	
10	Unit 10: Zoogeography Zoogeographical realms, Plate tectonic and Continental drift theory, distribution of birds and mammals in	4	Dr. SUDIPTA CHAKRABORTY	

	different realms			
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Semester III (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: C5P: Chordates Lab (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Protochordata <i>Balanoglossus, Herdmania, Branchiostoma</i>	2	DEBARSHI MONDAL	
2	2. Agnatha <i>Petromyzon, Myxine</i>	2	DEBARSHI MONDAL	
3	3. Fishes <i>Scoliodon, Sphyrna, Pristis, Torpedo, Chimaera, Mystus, Heteropneustes, Labeo, Exocoetus, Echeneis, Anguilla, Hippocampus, Tetradon/ Diodon, Anabas, Flat fish</i>	2	DEBARSHI MONDAL	
4	4. Amphibia <i>Necturus, Bufo, Hyla, Alytes, Axolotl, Tylotriton</i>	2	Dr. MANIDIP SHASMAL	
5	5. Reptilia <i>Chelone, Trionyx, Hemidactylus, Varanus, Uromastix, Chamaeleon, Ophiosaurus, Draco, Bungarus, Vipera, Naja, Hydrophis, Zamenis, Crocodylus. Key for Identification of poisonous and non-poisonous snakes</i>	2	Dr. MANIDIP SHASMAL	
6	6. Mammalia: Bat (Insectivorous and Frugivorous), <i>Funambulus</i>	2	Dr. SUDIPTA CHAKRABORTY	
7	7. Pecten from Fowl head	2	Dr. SUDIPTA CHAKRABORTY	
8	8. Dissection of brain and pituitary of Tilapia	1	Dr. SUDIPTA CHAKRABORTY	
9	9. Power point presentation on study of any two animals from two different classes by students (may be included if dissections not given permission)	1	Dr. SUDIPTA CHAKRABORTY	

Semester III (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: CC-6: Animal Physiology: Controlling & Coordinating Systems (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Tissues Structure, location, classification and functions of epithelial tissue, connective tissue, muscular tissue and nervous tissue and, fixation and staining of tissues.	8	Dr. MANIDIP SHASMAL	
2	Unit 2: Bone and Cartilage Structure and types of bones and cartilages, Ossification	8	Dr. SUDIPTA CHAKRABORTY	
3	Unit 3: Nervous System Structure of neuron, resting membrane potential, Origin of action potential and its propagation across the myelinated and unmyelinated nerve fibers; Types of synapse, Synaptic transmission and Neuromuscular junction; Reflex action and its types	8	Dr. MANIDIP SHASMAL	
4	Unit 4: Muscular system Histology of different types of muscle; Ultra structure of skeletal muscle; Molecular and chemical basis of muscle contraction; Characteristics of muscle fibre	8	Dr. SUDIPTA CHAKRABORTY	
5	Unit 5: Reproductive System Histology of testis and ovary Physiology of Reproduction	8	DEBARSHI MONDAL	
6	Unit 6: Endocrine System Histology and function of pituitary, thyroid, pancreas and adrenal Classification of hormones; Mechanism of Hormone action Signal transduction pathways for Steroidal and Non steroidal hormones Hypothalamus (neuroendocrine gland) - principal nuclei involved in neuroendocrine control of anterior pituitary and endocrine system Placental hormones	10	DEBARSHI MONDAL	

Semester III (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: C6P: Animal Physiology: Controlling & Coordinating Systems Lab (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Recording of simple muscle twitch with electrical stimulation (or Virtual)	3	Dr. SUDIPTA CHAKRABORTY	
2	2. Demonstration of the unconditioned reflex	3	Dr. SUDIPTA	

	action (Deep tendon reflex such as knee jerk reflex)		CHAKRABORTY	
3	3. Preparation of temporary mounts: Squamous epithelium, Striated muscle fibres and nerve cells	3	Dr. MANIDIP SHASMAL	
4	4. Study of permanent slides of Mammalian skin, Cartilage, Bone, Spinal cord, Nerve cell, Pituitary, Pancreas, Testis, Ovary, Adrenal, Thyroid and Parathyroid	3	DEBARSHI MONDAL	
5	5. Microtomy: Preparation of permanent slide of any five mammalian (Goat/white rat) tissues	4	DEBARSHI MONDAL	

Semester III (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: CC-7: Fundamentals of Biochemistry (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Carbohydrates Structure and Biological importance: Monosaccharides, Disaccharides, Polysaccharides; Derivatives of Monosachharides Carbohydrate metabolism: Glycolysis, Citric acid cycle, Pentose phosphate pathway, Gluconeogenesis	8	Dr. MANIDIP SHASMAL	
2	Unit 2: Lipids Structure and Significance: Physiologically important saturated and unsaturated fatty acids, Tri-acylglycerols, Phospholipids, Sphingolipid, Glycolipids, Steroids, Eicosanoids and terpinoids. Lipid metabolism: β -oxidation of fatty acids; Fatty acid biosynthesis	8	Dr. MANIDIP SHASMAL	
3	Unit 3: Proteins Amino acids Structure, Classification, General and Electro chemical properties of α -amino acids; Physiological importance of essential and non-essential amino acids Proteins Bonds stabilizing protein structure; Levels of organization Protein metabolism: Transamination, Deamination, Urea cycle, Fate of C-skeleton of Glucogenic and Ketogenic amino acids	8	Dr. MANIDIP SHASMAL	
4	Unit 4: Nucleic Acids Structure: Purines and pyrimidines, Nucleosides, Nucleotides, Nucleic acids Types of DNA and RNA, Complementarity of DNA, Hpyo- Hyperchromaticity of DNA Basic concept of nucleotide metabolism	10	Dr. SUDIPTA CHAKRABORTY	

5	Unit 5: Enzymes Nomenclature and classification; Cofactors; Specificity of enzyme action; Isozymes; Mechanism of enzyme action; Enzyme kinetics; Derivation of Michaelis-Menten equation, Lineweaver-Burk plot; Factors affecting rate of enzyme-catalyzed reactions; Enzyme inhibition; Allosteric enzymes and their kinetics; Strategy of enzyme action- Catalytic and Regulatory (Basic concept with one example each)	10	DEBARSHI MONDAL	
6	Unit 6: Oxidative Phosphorylation Redox systems; Review of mitochondrial respiratory chain, Inhibitors and un-couplers of Electron Transport System	6	Dr. SUDIPTA CHAKRABORTY	

Semester III (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: C7P: Fundamentals of Biochemistry Lab (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Qualitative tests of functional groups in carbohydrates, proteins and lipid	3	DEBARSHI MONDAL	
2	2. Paper chromatography of amino acids.	3	DEBARSHI MONDAL	
3	3. Quantitative estimation of Lowry Methods	3	Dr. MANIDIP SHASMAL	
4	4. Demonstration of proteins separation by SDS-PAGE.	2	Dr. MANIDIP SHASMAL	
5	5. To study the enzymatic activity of Trypsin and Lipase.	2	Dr. MANIDIP SHASMAL	
6	6. To perform the Acid and Alkaline phosphatase assay from serum/ tissue.	3	Dr. SUDIPTA CHAKRABORTY	

Semester III (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: SEC1: Apiculture (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biology of Bees History, Classification and Biology of Honey Bees Social Organization of Bee Colony	10	Dr. SUDIPTA CHAKRABORTY	
2	Unit 2: Rearing of Bees Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth Bee Pasturage Selection of Bee Species for Apiculture Bee Keeping Equipment Methods of Extraction of Honey (Indigenous and Modern)	10	Dr. SUDIPTA CHAKRABORTY	
3	Unit 3: Diseases and Enemies Bee Diseases and Enemies Control and Preventive measures	10	DEBARSHI MONDAL	
4	Unit 4: Bee Economy Products of Apiculture Industry and its Uses (Honey, Bees Wax, Propolis), Pollen etc	10	DEBARSHI MONDAL	
5	Unit 5: Entrepreneurship in Apiculture Bee Keeping Industry – Recent Efforts, Modern Methods in employing artificial. Beehives for cross pollination in horticultural gardens	10	Dr. MANIDIP SHASMAL	

Semester III (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: GE-3: Aquatic Biology (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	UNIT 1: Aquatic Biomes Brief introduction of the aquatic biomes: Freshwater ecosystem (lakes, wetlands, streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine benthic zone and coral reefs.	12	DEBARSHI MONDAL	
2	UNIT 2: Freshwater Biology Lakes: Origin and classification, Lake as an Ecosystem, Lake morphometry, Physico-chemical Characteristics: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity; Dissolved gases (oxygen, carbon dioxide). Nutrient Cycles in Lakes- Nitrogen, Sulphur and Phosphorous. Streams: Different stages of stream development, Physico-chemical environment, Adaptation of hill-stream fishes.	13	DEBARSHI MONDAL	

3	UNIT 3: Marine Biology Salinity and density of Sea water, Continental shelf, Adaptations of deep sea organisms, Coral reefs, Sea weeds.	12	Dr. SUDIPTA CHAKRABORTY	
4	UNIT 4: Management of Aquatic Resources Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Sewage treatment Water quality assessment- BOD and COD.	13	Dr. MANIDIP SHASMAL	

Semester III (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: GE3 P: Aquatic Biology Lab (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Determine the area of a lake using graphimetric and gravimetric method.	3	DEBARSHI MONDAL	
2	2. Identify the important macrophytes, phytoplanktons and zooplanktons present in a lake ecosystem.	4	DEBARSHI MONDAL	
3	3. Determine the amount of Turbidity/transparency, Dissolved oxygen, carbon dioxide, alkalinity (carbonates & bicarbonates) in water collected from a nearby lake/ water body.	5	Dr. MANIDIP SHASMAL	
4	4. Instruments used in limnology (Secchi disc, Van Dorn Bottle, Conductivity meter, Turbidity meter, PONAR grab sampler) and their significance.	3	Dr. SUDIPTA CHAKRABORTY	
5	5. A Project Report on a visit to a Sewage treatment plant/Marine bioreserve/ Fisheries Institutes	1	Dr. SUDIPTA CHAKRABORTY	

Curriculum Plan (ODD SEMESTER)
Semester V
(Zoology Honours; CBCS)

Semester V (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: CC-11: Molecular Biology (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Nucleic Acids Salient features of DNA and RNA. Watson and Crick Model of DNA	5	Dr. SUDIPTA CHAKRABORTY	
2	Unit 2: DNA Replication Mechanism of DNA Replication in Prokaryotes, Semi-conservative, bidirectional and discontinuous Replication, RNA priming, Replication of telomeres	8	DEBARSHI MONDAL	
3	Unit 3: Transcription Mechanism of Transcription in prokaryotes and eukaryotes, Transcription factors, Difference between prokaryotic and eukaryotic transcription	8	Dr. SUDIPTA CHAKRABORTY	
4	Unit 4: Translation Mechanism of protein synthesis in prokaryotes, Ribosome structure and assembly in prokaryotes, fidelity of protein synthesis, aminoacyl tRNA synthetases and charging of tRNA; Proteins involved in initiation, elongation and termination of polypeptide chain; Genetic code, Degeneracy of the genetic code and Wobble Hypothesis; Inhibitors of protein synthesis; Difference between prokaryotic and eukaryotic translation	8	Dr. MANIDIP SHASMAL	
5	Unit 5: Post Transcriptional Modifications and Processing of Eukaryotic RNA Capping and Poly A tail formation in mRNA; Split genes: concept of introns and exons, splicing mechanism, alternative splicing, exon shuffling, and RNA editing, Processing of tRNA	5	Dr. MANIDIP SHASMAL	
6	Unit 6: Gene Regulation Regulation of Transcription in prokaryotes: <i>lac</i> operon and <i>trp</i> operon; Regulation of Transcription in eukaryotes: Activators, enhancers, silencer, repressors, miRNA mediated gene silencing, Genetic imprinting	5	DEBARSHI MONDAL	
7	Unit 7: DNA Repair Mechanisms Types of DNA repair mechanisms, RecBCD model in prokaryotes, nucleotide and base excision repair, SOS repair	5	Dr. MANIDIP SHASMAL	
8	Unit 8: Molecular Techniques PCR, Western and Southern blot, Northern Blot, Sanger DNA sequencing	6	Dr. MANIDIP SHASMAL	

Semester V (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: C11P: Molecular Biology (Practical)		Full Marks: 20		Credit:2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Demonstration of polytene and lampbrush chromosome from photograph	5	DEBARSHI MONDAL	
2	2. Isolation and quantification of genomic DNA using spectrophotometer (A260 measurement)	5	Dr. SUDIPTA CHAKRABORTY	
3	3. Agarose gel electrophoresis for DNA	6	Dr. MANIDIP SHASMAL	

Semester V (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: CC-12: Genetics (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Mendelian Genetics and its Extension Principles of inheritance, Incomplete dominance and co-dominance, Epistasis Multiple alleles, Lethal alleles, Pleiotropy, Sex-linked, sex- influenced and sex-limited inheritance, Polygenic Inheritance	8	DEBARSHI MONDAL	
2	Unit 2: Linkage, Crossing Over and Chromosomal Mapping Linkage and Crossing Over, molecular basis of crossing over, Measuring Recombination frequency and linkage intensity using three factor crosses, Interference and coincidence	8	DEBARSHI MONDAL	
3	Unit 3: Mutations Types of gene mutations (Classification), Types of chromosomal aberrations (Classification with one suitable example of each), Non-disjunction and variation in chromosome number; Molecular basis of mutations in relation to UV light and chemical mutagens	8	Dr. SUDIPTA CHAKRABORTY	
4	Unit 4: Sex Determination Mechanisms of sex determination in <i>Drosophila</i> Sex determination in mammals Dosage compensation in <i>Drosophila</i> & Human	8	Dr. SUDIPTA CHAKRABORTY	
5	Unit 5: Extra-chromosomal Inheritance Criteria for extra chromosomal inheritance, Antibiotic resistance in <i>Chlamydomonas</i> , Kappa particle in <i>Paramecium</i> Shell spiralling	5	Dr. MANIDIP SHASMAL	

	in snail			
6	Unit 6: Recombination in Bacteria and Viruses Conjugation, Transformation, Transduction, Complementation test in Bacteriophage	7	Dr. MANIDIP SHASMAL	
7	Unit 7: Transposable Genetic Elements Transposons in bacteria, Ac-Ds elements in maize and P elements in <i>Drosophila</i> , LINE, SINE, Alu elements in humans	6	DEBARSHI MONDAL	

Semester V (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: C12P: Genetics (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Chi-square analyses	5	Dr. SUDIPTA CHAKRABORTY	
2	2. Linkage maps based on conjugation	3	Dr. MANIDIP SHASMAL	
3	3. Identification of chromosomal aberration in <i>Drosophila</i> and man from photograph	3	DEBARSHI MONDAL	
4	4. Pedigree analysis of some human inherited traits	5	DEBARSHI MONDAL	

Semester V (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: DSE-1: Reproductive Biology (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Reproductive Endocrinology Mechanism of action of steroids and glycoprotein hormones. hypothalamo – hypophyseal – gonadal axis, regulation of gonadotrophin secretion in human (male and female) Reproductive system: Development and differentiation of gonads, genital ducts and external genitalia	12	DEBARSHI MONDAL	
2	Unit 2: Functional anatomy of male reproduction Histoarchitecture of testis in human; Spermatogenesis; Kinetics and hormonal regulation; Androgen synthesis and metabolism; Accessory glands functions	12	Dr. MANIDIP SHASMAL	
3	Unit 3: Functional anatomy of female reproduction	14	Dr. SUDIPTA CHAKRABORTY	

	Histoarchitecture of ovary in human; Oogenesis; Kinetics and hormonal regulation; Steroidogenesis and secretion of ovarian hormones; Reproductive cycles (human) and their regulation, fertilization; Hormonal control of implantation; Hormonal regulation of gestation, pregnancy diagnosis, foeto – maternal relationship; Mechanism of parturition and its hormonal regulation; Lactation and its Regulation			
4	Unit 4: Reproductive Health Infertility in male and female: causes, diagnosis and management Assisted Reproductive Technology: sex selection, sperm banks, frozen embryos, in vitro fertilization Modern contraceptive technologies	12	Dr. SUDIPTA CHAKRABORTY	

Semester V (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: DSE1P: Reproductive Biology (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of animal house: set up and maintenance of animal house, breeding techniques, care of normal and experimental animals.	4	Dr. SUDIPTA CHAKRABORTY	
2	2. Examination of vaginal smear rats from live animals.	2	Dr. MANIDIP SHASMAL	
3	3. Tissue fixation, embedding in paraffin, microtomy and slide preparation of any endocrine gland	5	DEBARSHI MONDAL	
4	4. Examination of histological sections from photomicrographs/ permanent slides of rat/human: testis, epididymis and accessory glands of male reproductive systems; Sections of ovary, fallopian tube, uterus (proliferative and secretory stages), cervix and vagina.	4	Dr. MANIDIP SHASMAL	
5	5. Sperm count and sperm motility in rat	1	Dr. MANIDIP SHASMAL	

Semester V (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: DSE-2: Animal Biotechnology (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Organization of prokaryotic and eukaryotic genome, Concept of genomics	8	Dr. MANIDIP SHASMAL	
2	Unit 2: Molecular Techniques in Gene	17	Dr. SUDIPTA	

	manipulation Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, M13, BAC, YAC, MAC and Expression vectors (characteristics). Restriction enzymes: Nomenclature, detailed study of Type II. Transformation techniques: Calcium chloride method and electroporation. Construction of genomic and cDNA libraries and screening by colony and plaque hybridization Southern, Northern and Western blotting DNA sequencing: Sanger method Polymerase Chain Reaction, DNA Finger Printing and DNA micro array		CHAKRABORTY	
3	Unit 3: Genetically Modified Organisms Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection. Applications of transgenic animals: Production of pharmaceuticals, production of donor organs, knock out mice	15	Dr. MANIDIP SHASMAL	
4	Unit 4: Culture Techniques and Applications Animal cell culture, expressing cloned genes in mammalian cells, Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle cell anemia)	10	DEBARSHI MONDAL	

Semester V (AY 2023-2024)		Period : July,2023 to Jan, 2024		
Paper: DSE2P (Animal Biotechnology) (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Genomic DNA isolation from <i>E. coli</i>	2	DEBARSHI MONDAL	
2	2. Plasmid DNA isolation (pUC 18/19) from <i>E. coli</i>	2	Dr. SUDIPTA CHAKRABORTY	
3	3. Restriction digestion of plasmid DNA.	2	Dr. SUDIPTA CHAKRABORTY	
4	4. Construction of circular and linear restriction map from the data provided.	3	Dr. SUDIPTA CHAKRABORTY	
5	5. Calculation of transformation efficiency from the data provided.	2	Dr. MANIDIP SHASMAL	
6	6. To study following techniques through photographs a. Southern Blotting b. Northern Blotting c. Western Blotting d. DNA Sequencing (Sanger's Method) e. PCR f. DNA fingerprinting 7. Project report on animal cell culture	4	Dr. MANIDIP SHASMAL	

7	7. Project report on animal cell culture	1	Dr. MANIDIP SHASMAL	

Curriculum Plan (ALL SEMESTER)

Semester I

(Zoology General; CBCS)

Semester I (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSC-1A (Animal Diversity) (Theory)		Full Marks:55		Credit:4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Kingdom Protista General characters and classification up to classes; Locomotory Organelles and locomotion in Protozoa	4	DEBARSHI MONDAL	
2	Unit 2: Phylum Porifera General characters and classification up to classes; Canal System in <i>Sycon</i>	3	DEBARSHI MONDAL	
3	Unit 3: Phylum Cnidaria General characters and classification up to classes; Polymorphism in Hydrozoa	3	DEBARSHI MONDAL	
4	Unit 4: Phylum Platyhelminthes General characters and classification up to classes; Life history of <i>Taenia solium</i>	3	DEBARSHI MONDAL	
5	Unit 5: Phylum Nematelminthes General characters and classification up to classes; Life history of <i>Ascaris lumbricoides</i> and its parasitic adaptations	3	DEBARSHI MONDAL	
6	Unit 6: Phylum Annelida General characters and classification up to classes; Metamerism in Annelida	3	DEBARSHI MONDAL	
7	Unit 7: Phylum Arthropoda General characters and classification up to classes; Vision in Arthropoda, Metamorphosis in Insects	4	DEBARSHI MONDAL	
8	Unit 8: Phylum Mollusca General characters and classification up to classes; Torsion in gastropods	3	Dr. MANIDIP SHASMAL	
9	Unit 9: Phylum Echinodermata General characters and classification up to classes; Water-vascular system in Asteroidea	3	Dr. MANIDIP SHASMAL	
10	Unit 10: Protochordates General features and Phylogeny of Protochordata	3	Dr. MANIDIP SHASMAL	
11	Unit 11: Agnatha	3	Dr. MANIDIP	

	General features of Agnatha and classification of cyclostomes up to classes		SHASMAL	
12	Unit 12: Pisces General features and Classification up to orders; Osmoregulation in Fishes	3	Dr. SUDIPTA CHAKRABORTY	
13	Unit 13: Amphibia General features and Classification up to orders; Parental care	3	Dr. SUDIPTA CHAKRABORTY	
14	Unit 14: Reptiles General features and Classification up to orders; Poisonous and non-poisonous snakes, Biting mechanism in snakes	3	Dr. SUDIPTA CHAKRABORTY	
15	Unit 15: Aves General features and Classification up to orders; Flight adaptations in birds	3	Dr. SUDIPTA CHAKRABORTY	
16	Unit 17: Mammals Classification up to orders; Origin of mammals	3	Dr. SUDIPTA CHAKRABORTY	

Semester I (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSC1AP (Animal diversity) (Practical)		Full Marks: 20		Credit:2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of the following specimens: <i>Amoeba, Euglena, Plasmodium, Paramecium, Sycon, Hyalonema, and Euplectella, Obelia, Physalia, Aurelia, Tubipora, Metridium, Taenia solium, Male and female Ascaris lumbricoides, Aphrodite, Nereis, Pheretima, Hirudinaria, Palaemon, Cancer, Limulus, Palamnaeus, Scolopendra, Julus, Periplaneta, Apis, Chiton, Dentalium, Pila, Unio, Loligo, Sepia, Octopus, Pentaceros, Ophiura, Echinus, Cucumaria and Antedon, Balanoglossus, Herdmania, Branchiostoma, Petromyzon, Sphyrna, Pristis, Torpedo, Labeo, Exocoetus, Anguilla, Ichthyophis/Ureotyphlus, Salamandra, Bufo, Hyla, Chelone, Hemidactylus, Chamaeleon, Draco, Vipera, Naja, Crocodylus, Gavialis, Any six common birds from different orders, Sorex, Bat, Funambulus, Loris</i>	10	DEBARSHI MONDAL	
2	2. Study of the following permanent slides: 1. T.S. and L.S. of <i>Sycon</i> , 2. Study of life history stages of <i>Taenia</i> , 3. T.S. of male and female <i>Ascaris</i>	3	Dr. MANIDIP SHASMAL	
3	3. Key for identification of poisonous and non-poisonous snakes An "animal album" containing photographs, cut outs, with appropriate write up about the above mentioned taxa. Different taxa/ topics may be given to different sets of students for this purpose.	3	Dr. SUDIPTA CHAKRABORTY	

Curriculum Plan Semester II
(Zoology Honours; CBCS)

Semester II (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSC-1B (Comparative Anatomy and Development Biology of Vertebrates) (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Integumentary System Derivatives of integument w.r.t. glands and digital tips	4	Dr. MANIDIP SHASMAL	
2	Unit 2: Skeletal System Evolution of visceral arches	4	Dr. MANIDIP SHASMAL	
3	Unit 3: Digestive System Brief account of alimentary canal and digestive glands	4	Dr. MANIDIP SHASMAL	
4	Unit 4: Respiratory System Brief account of gills, lungs, air sacs and swim bladder	4	Dr. MANIDIP SHASMAL	
5	Unit 5: Circulatory System Evolution of heart and aortic arches	5	DEBARSHI MONDAL	
6	Unit 6: Urinogenital System Succession of kidney, Evolution of urinogenital ducts	5	DEBARSHI MONDAL	
7	Unit 7: Nervous System Comparative account of brain	5	DEBARSHI MONDAL	
8	Unit 8: Sense Organs Receptors and its types.	4	DEBARSHI MONDAL	
9	Unit 9: Early Embryonic Development Gametogenesis: Spermatogenesis and oogenesis w.r.t. mammals, vitellogenesis in birds; Fertilization: external (amphibians), internal (mammals), blocks to polyspermy; Early development of frog and humans (structure of mature egg and its membranes, patterns of cleavage, fate map, up to	5	Dr. SUDIPTA CHAKRABORTY	

	formation of gastrula);types of morphogenetic movements; Fate of germ layers; Neurulation in frog embryo.			
10	Unit 10: Late Embryonic Development Implantation of embryo in humans, Formation of human placenta and functions, other types of placenta on the basis of histology; Metamorphic events in frog life cycle and its hormonal regulation.	5	Dr. SUDIPTA CHAKRABORTY	
11	Unit 11: Control of Development Fundamental processes in development (brief idea) – Gene activation, determination, induction, Differentiation, morphogenesis, intercellular communication, cell movements and cell death	5	Dr. SUDIPTA CHAKRABORTY	

Semester II (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSC1BP (Comparative Anatomy and Developmental Biology of Vertebrates) (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Osteology: a) Disarticulated skeleton of fowl and rabbit b) Carapace and plastron of turtle /tortoise c) Mammalian skulls: One herbivorous and one carnivorous animal.	3	Dr. SUDIPTA CHAKRABORTY	
2	2. Frog - Study of developmental stages - whole mounts and sections through permanent slides – cleavage stages, blastula, gastrula neurula, tail bud stage, tadpole external and internal gill stages.	4	Dr. SUDIPTA CHAKRABORTY	
3	3. Study of the different types of placenta-histological sections through permanent slides or photomicrographs.	3	DEBARSHI MONDAL	
4	4. Study of placental development in humans by ultrasound scans.	3	Dr. MANIDIP SHASMAL	
5	5. Examination of gametes - frog/rat - sperm and ova through permanent slides or photomicrographs	3	Dr. MANIDIP SHASMAL	

Curriculum Plan
Semester III
(Zoology Honours; CBCS)

Semester III (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSC1CT (Physiology and Biochemistry) (Theory)		Full Marks: 55 Credit: 4		
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Nerve and muscle Structure of a neuron, Resting membrane potential, Graded potential, Origin of Action potential and its propagation in myelinated and non-myelinated nerve fibres, Ultra-structure of skeletal muscle, Molecular and chemical basis of muscle contractio	5	DEBARSHI MONDAL	
2	Unit 2: Digestion Physiology of digestion in the alimentary canal; Absorption of carbohydrates, proteins, lipids	5	DEBARSHI MONDAL	
3	Unit 3: Respiration Pulmonary ventilation, Respiratory volumes and capacities, Transport of oxygen and carbon dioxide in blood.	5	DEBARSHI MONDAL	
4	Unit 4: Excretion Structure of nephron, Mechanism of Urine formation, Counter-current Mechanism	5	Dr. SUDIPTA CHAKRABORTY	
5	Unit 5: Cardiovascular system Composition of blood, Hemostasis, Structure of Heart, Origin and conduction of the cardiac impulse, Cardiac cycle	5	Dr. SUDIPTA CHAKRABORTY	
6	Unit 6: Reproduction and Endocrine Glands Physiology of male reproduction: Hormonal control of spermatogenesis; Physiology of female reproduction: hormonal control of menstrual cycle Structure and function of pituitary, thyroid, parathyroid, pancreas and adrenal	5	Dr. SUDIPTA CHAKRABORTY	
7	Unit 7: Carbohydrate Metabolism Glycolysis, Krebs Cycle, Pentose phosphate pathway, Gluconeogenesis, Glycogen metabolism, Review of electron transport chain	5	Dr. MANIDIP SHASMAL	
8	Unit 8: Lipid Metabolism Biosynthesis and β oxidation of palmitic acid	5	Dr. MANIDIP SHASMAL	
9	Unit 9: Protein metabolism Transamination, Deamination and Urea cycle	5	Dr. MANIDIP SHASMAL	

10	Unit 10: Enzymes Introduction, Mechanism of action, Enzyme kinetics, inhibition and regulation	5	DEBARSHI MONDAL	
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Semester III (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSC1CP (Physiology and Biochemistry) (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Preparation of hemin and hemochromogen crystals.	2	Dr. SUDIPTA CHAKRABORTY	
2	2. Study of permanent histological sections of mammalian pituitary, thyroid, pancreas, adrenal gland.	3	DEBARSHI MONDAL	
3	3. Study of permanent slides of spinal cord, duodenum, liver, lung, kidney, bone, cartilage.	3	DEBARSHI MONDAL	
4	4. Qualitative tests to identify functional groups of carbohydrates in given solutions (Glucose, Fructose, Sucrose, Lactose).	4	Dr. MANIDIP SHASMAL	
5	5. Estimation of total protein in given solutions by Lowry's method.	2	Dr. MANIDIP SHASMAL	
6	6. Study of activity of salivary amylase under optimum condition	2	Dr. SUDIPTA CHAKRABORTY	

Semester III (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: SEC1T (Apiculture) (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Biology of Bees History, Classification and Biology of Honey Bees. Social Organization of Bee Colony	10	Dr. SUDIPTA CHAKRABORTY	
2	Unit 2: Rearing of Bees Artificial Bee rearing (Apiary), Beehives – Newton and Langstroth. Bee Pasturage. Selection of Bee Species for Apiculture. Bee Keeping Equipment. Methods of Extraction of Honey (Indigenous and Modern)	10	Dr. SUDIPTA CHAKRABORTY	
3	Unit 3: Diseases and Enemies Bee Diseases and Enemies. Control and Preventive measures.	10	DEBARSHI MONDAL	

4	Unit 4: Bee Economy Products of Apiculture Industry and its Uses (Honey, Bees Wax, Propolis), Pollen etc	10	DEBARSHI MONDAL	
5	Unit 5: Entrepreneurship in Apiculture Bee Keeping Industry – Recent Efforts, Modern Methods in employing artificial. Beehives for cross pollination in horticultural gardens	10	Dr. MANIDIP SHASMAL	

**Curriculum Plan
Semester IV**

(Zoology Honours; CBCS)

Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSC-1D (Genetics and Evolutionary Biology) (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to Genetics Mendel's work on transmission of traits, Genetic Variation, Molecular basis of genetic information	4	DEBARSHI MONDAL	
2	Unit 2: Mendelian Genetics and its Extension Principles of Inheritance, Chromosome theory of inheritance, Incomplete dominance and codominance, Multiple alleles, Lethal alleles, Epistasis, Pleiotropy, sex linked inheritance, extra-chromosomal inheritance	4	DEBARSHI MONDAL	
3	Unit 3: Linkage, Crossing Over and Chromosomal Mapping Linkage and crossing over, Recombination frequency as a measure of linkage intensity, two factor and three factor crosses, Interference and coincidence, Somatic cell genetics – an alternative approach to gene mapping	5	DEBARSHI MONDAL	
4	Unit 4: Mutations Chromosomal Mutations: Deletion; Duplication; Inversion; Translocation; Aneuploidy and Polyploidy; Gene mutations: Induced versus Spontaneous mutations, Back versus Suppressor mutations,	4	DEBARSHI MONDAL	
5	Unit 5: Sex Determination Chromosomal mechanisms, dosage compensation	4	DEBARSHI MONDAL	
6	Unit 6: History of Life Major Events in History of Life	4	Dr. SUDIPTA CHAKRABORTY	
7	Unit 7: Introduction to Evolutionary Theories	4	Dr. SUDIPTA	

	Lamarckism, Darwinism, Neo-Darwinism		CHAKRABORTY	
8	Unit 8: Direct Evidences of Evolution Types of fossils, Incompleteness of fossil record, Dating of fossils, Phylogeny of horse	4	Dr. SUDIPTA CHAKRABORTY	
9	Unit 9: Processes of Evolutionary Change Organic variations; Isolating Mechanisms; Natural selection (Example: Industrial melanism); Types of natural selection (Directional, Stabilizing, Disruptive), Artificial selection	4	Dr. SUDIPTA CHAKRABORTY	
10	Unit 10: Species Concept Biological species concept (Advantages and Limitations); Modes of speciation (Allopatric, Sympatric)	5	Dr. MANIDIP SHASMAL	
11	Unit 11: Macro-evolution Macro-evolutionary Principles (example: Darwin's Finches)	4	Dr. MANIDIP SHASMAL	
12	Unit 12: Extinction Mass extinction (Causes, Names of five major extinctions, K-T extinction in detail), Role of extinction in evolution	4	Dr. MANIDIP SHASMAL	

Semester IV (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSC1DP (Genetics and Evolutionary Biology) (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Study of Mendelian inheritance and gene interactions (Non- Mendelian inheritance) using suitable examples. Verify the results using Chi-square test.	3	Dr. SUDIPTA CHAKRABORTY	
2	2. Study of Linkage, recombination, gene mapping using the data.	2	Dr. SUDIPTA CHAKRABORTY	
3	3. Study of Human Karyotypes (normal and abnormal).	3	DEBARSHI MONDAL	
4	4. Study of fossil evidences from plaster cast models and pictures	2	DEBARSHI MONDAL	
5	5. Study of homology and analogy from suitable specimens/ pictures	2	DEBARSHI MONDAL	
6	6. Charts: a. Phylogeny of horse with diagrams/ cut outs of limbs and teeth of horse ancestors b. Darwin's Finches with diagrams/ cut outs	3	Dr. MANIDIP SHASMAL	

	of beaks of different species			
7	7. Visit to Natural History Museum and submission of report	1	Dr. MANIDIP SHASMAL	

**Curriculum Plan
Semester V**

(Zoology Honours; CBCS)

Semester V (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE1T (Aquatic biology) (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	UNIT 1: Aquatic Biomes Brief introduction of the aquatic biomes: Freshwater ecosystem (lakes, wetlands, streams and rivers), estuaries, intertidal zones, oceanic pelagic zone, marine benthic zone and coral reefs.	12	DEBARSHI MONDAL	
2	UNIT 2: Freshwater Biology Lakes: Origin and classification, Lake as an Ecosystem, Lake morphometry, Physico-chemical Characteristics: Light, Temperature, Thermal stratification, Dissolved Solids, Carbonate, Bicarbonates, Phosphates and Nitrates, Turbidity; Dissolved gases (oxygen, carbon dioxide). Nutrient Cycles in Lakes- Nitrogen, Sulphur and Phosphorous. Streams: Different stages of stream development, Physico-chemical environment, Adaptation of hill-stream fishes.	13	DEBARSHI MONDAL	
3	UNIT 3: Marine Biology Salinity and density of Sea water, Continental shelf, Adaptations of deep sea organisms, Coral reefs, Sea weeds.	12	Dr. SUDIPTA CHAKRABORTY	
4	UNIT 4: Management of Aquatic Resources Causes of pollution: Agricultural, Industrial, Sewage, Thermal and Oil spills, Eutrophication, Management and conservation (legislations), Sewage treatment Water quality assessment- BOD and COD.	13	Dr. MANIDIP SHASMAL	

Semester V (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE1P (Aquatic Biology) (Practical)		Full Marks: 20		Credit: 2
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Determine the area of a lake using graphimetric and gravimetric method.	3	DEBARSHI MONDAL	

2	2. Identify the important macrophytes, phytoplanktons and zooplanktons present in a lake ecosystem.	4	DEBARSHI MONDAL	
3	3. Determine the amount of Turbidity/transparency, Dissolved oxygen, carbon dioxide, alkalinity (carbonates & bicarbonates) in water collected from a nearby lake/ water body.	5	Dr. MANIDIP SHASMAL	
4	4. Instruments used in limnology (Secchi disc, Van Dorn Bottle, Conductivity meter, Turbidity meter, PONAR grab sampler) and their significance.	3	Dr. SUDIPTA CHAKRABORTY	
5	5. A Project Report on a visit to a Sewage treatment plant/Marine bioreserve/ Fisheries Institutes	1	Dr. SUDIPTA CHAKRABORTY	

Semester V (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: SEC3T (Medical Diagnostics) (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction to Medical Diagnostics and its Importance	8	Dr. MANIDIP SHASMAL	
2	Unit 2: Diagnostics Methods Used for Analysis of Blood Blood composition, Preparation of blood smear and Differential Count (D.C) using Leishman's stain, Platelet count using haemocytometer, Erythrocyte Sedimentary Rate (E.S.R), Packed Cell Volume (P.C.V.)	10	Dr. SUDIPTA CHAKRABORTY	
3	Unit 3: Diagnostic Methods Used for Urine Analysis Urine Analysis: Physical characteristics; Abnormal constituents	8	Dr. SUDIPTA CHAKRABORTY	
4	Unit 4: Non-infectious Diseases Causes, types, symptoms, complications, diagnosis and prevention of Diabetes (Type I and Type II), Hypertension (Primary and secondary), Testing of blood glucose using Glucometer/Kit	8	Dr. MANIDIP SHASMAL	
5	Unit 5: Infectious Diseases Causes, types, symptoms, diagnosis and prevention of Tuberculosis and Hepatitis	8	Dr. MANIDIP SHASMAL	
5	Unit 6: Tumours Types (Benign/Malignant), Detection and metastasis; Medical imaging: X-Ray of Bone fracture, PET, MRI and CT Scan (using photographs).	8	DEBARSHI MONDAL	

Curriculum Plan
Semester VI
(Zoology GENERAL; CBCS)

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE2T (Animal Biotechnology) (Theory)		Full Marks: 55		Credit: 4
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	Unit 1: Introduction Concept and scope of biotechnology	8	Dr. MANIDIP SHASMAL	
2	Unit 2: Molecular Techniques in Gene manipulation Cloning vectors: Plasmids, Cosmids, Phagemids, Lambda Bacteriophage, M13, BAC, YAC, MAC and Expression vectors (characteristics) Restriction enzymes: nomenclature, detailed study of Type II. Transformation techniques: Calcium chloride method and electroporation. Construction of genomic and cDNA libraries and screening by colony and plaque hybridization Southern, Northern and Western blotting; DNA sequencing: Sanger method; Polymerase Chain Reaction, DNA Finger Printing and DNA micro array	16	Dr. SUDIPTA CHAKRABORTY	
3	Unit 3: Genetically Modified Organisms Production of cloned and transgenic animals: Nuclear Transplantation, Retroviral Method, DNA microinjection, Applications of transgenic animals: Production of pharmaceuticals, production of donor organs, knockout mice. Production of transgenic plants: <i>Agrobacterium</i> mediated transformation. Applications of transgenic plants: insect and herbicide resistant plants.	16	Dr. MANIDIP SHASMAL	
4	Unit 4: Culture Techniques and Applications Animal cell culture, Expressing cloned genes in mammalian cells, Molecular diagnosis of genetic diseases (Cystic fibrosis, Sickle cell anemia); Recombinant DNA in medicines: Recombinant insulin and human growth hormone, Gene therapy	10	DEBARSHI MONDAL	

Semester VI (AY 2023-2024)		Period: Feb,2023 to July,2023		
Paper: DSE2P (Animal Biotechnology)		Full Marks: 20		Credit: 2

) (Practical)				
Sl. No.	TOPICS	CLASSES ALLOTTED	Class taken by	Remark
1	1. Genomic DNA isolation from <i>E. coli</i>	2	DEBARSHI MONDAL	
2	2. Plasmid DNA isolation (pUC 18/19) from <i>E. coli</i>	2	Dr. SUDIPTA CHAKRABORTY	
3	3. Restriction digestion of plasmid DNA.	2	Dr. SUDIPTA CHAKRABORTY	
4	4. Construction of circular and linear restriction map from the data provided.	3	Dr. SUDIPTA CHAKRABORTY	
5	5. Calculation of transformation efficiency from the data provided.	2	Dr. MANIDIP SHASMAL	
6	6. To study following techniques through photographs a. Southern Blotting b. Northern Blotting c. Western Blotting d. DNA Sequencing (Sanger's Method) e. PCR f. DNA fingerprinting 7. Project report on animal cell culture	5	Dr. MANIDIP SHASMAL	