SYLLABUS

DD0401-Dual Degree B.Tech.-M.Tech. in Converging Technologies

Dy. Registrar
(Academic)
University of Rajasthan
JAIPUR

2024-2028

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Name of University	**University of Rajasthan, Jaipur**
Name of Faculty	**Engineering and Technology**
Name of Discipline	**Converging Technologies**

First Semester

Year	Semester	S. No.	Course Code	Course Title	Subject Area	Credits	Contacts Hours/Week				Total Marks	CA			EoSE		
							L	T	P	Total		Max. Marks	Min. Marks	Midterm Test Duration	Max. Marks	Min. Marks	Duration
1	I	1	CCT-51T-HSMC-101	Communication Skills	HSMC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	I	2	CCT-51T-BSC-101	Physics-I	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	I	3	CCT-51T-BSC-102	Chemistry-I	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	I	4	CCT-51T-BSC-103	Mathematics-I	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	I	5	CCT-51T-BSC-104	Genetics	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	I	6	CCT-51P-BSC-121	Physics Lab - I	BSC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
1	I	7	CCT-51P-BSC-122	Chemistry Lab -I	BSC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
1	I	8	CCT-51P-BSC-123	Life Sciences Lab	BSC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
1	I	9	CCT-51T-ESC-101	Programming in C	ESC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	I	10	CCT-51T-ESC-102	Biochemistry	ESC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	I	11	CCT-51T-ESC-103	Basic Psychological Processes	ESC	**2**	2	0	0	**2**	50	10	4	1	40	16	3

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1	I	12	CCT-51P-ESC-121	Programming in C Lab	ESC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
1	I	13	CCT-51F-MC-101	Anandam-I	MC	**0**	0	0	0	**0**	50				50	20	
						24	**16**	**0**	**16**	**32**	**600**						

Semester	Category	HSMC	BSC	ESC	PCC	PEC	OEC	LC	MC	Total
I	Credit	2	14	8	0	0	0	0	0	24

Second Semester

Year	Semester	S. No.	Course Code	Course Title	Subject Area	Credits	Contacts Hours/Week				Total Marks	CA			EoSE		
							L	T	P	Total		Max. Marks	Min. Marks	Midterm Test Duration	Max. Marks	Min. Marks	Duration
1	II	1	CCT-52T-HSMC-102	Scientific Writing	HSMC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	II	2	CCT-52T-BSC-105	Physics-II	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	II	3	CCT-52T-BSC-106	Chemistry-II	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	II	4	CCT-52T-BSC-107	Mathematics-II	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	II	5	CCT-52T-BSC-108	Cell Biology	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	II	6	CCT-52P-BSC-124	Physics Lab - II	BSC	**2**	0	0	4	**4**	50	50	10	2	2	40	4
1	II	7	CCT-52P-BSC-125	Chemistry Lab - II	BSC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
1	II	8	CCT-52P-BSC-126	Cell Biology Lab	BSC	**2**	0	0	4	**4**	50	10	4	2	40	16	4

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1	II	9	CCT-52T-ESC-104	Semiconductor Electronics Devices and Applications	ESC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	II	10	CCT-52T-ESC-105	Object Oriented Programming	ESC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	II	11	CCT-52P-ESC-122	Semiconductor Electronics Lab	ESC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
1	II	12	CCT-52P-ESC-123	C++ Programming Lab	ESC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
1	II	13	CCT-52F-MC-102	Environmental Studies	MC	**0**	0	0	0	**0**	50				50	20	
						24	**16**	**0**	**16**	**32**	**600**						

Semester	Category	HSMC	BSC	ESC	PCC	PEC	OEC	LC	MC	Total
II	**Credit**	**2**	**14**	**8**	**0**	**0**	**0**	**0**	**0**	**24**

Third Semester

Year	Semester	S. No.	Course Code	Course Title	Subject Area	Credits	Contacts Hours/Week				Total Marks	CA			EoSE		
							L	T	P	Total		Max. Marks	Min. Marks	Midterm Test Duration	Max. Marks	Min. Marks	Duration
2	III	1	CCT-63T-HSMC-201	Industrial Economics	HSMC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	III	2	CCT-63T-BSC-201	Quantum Physics	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3

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2	III	3	CCT-63T-BSC-202	Principle and Application of Molecular Spectroscopy	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	III	4	CCT-63T-BSC-203	Advanced Mathematics	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	III	5	CCT-63T-BSC-204	Development Biology	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	III	6	CCT-63T-PCC-201	Physics of Materials	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	III	8	CCT-63T-PCC-202	Molecular Biology	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	III	9	CCT-63T-PCC-203	Cognitive Psychology	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	III	7	CCT-63P-PCC-221	Material Science Lab	PCC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
2	III	10	CCT-63P-PCC-222	Psychology Lab	PCC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
2	III	11	CCT-63T-ESC-201	Programming in Java	ESC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	III	12	CCT-63P-ESC-221	Java Programming Lab	ESC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
2	III	13	CCT-63F-MC-201	Anandam-II	MC	**0**	0	0	0	**0**	50				50	20	
						24	**18**	**0**	**12**	**30**							

Semester	Category	HSMC	BSC	ESC	PCC	PEC	OEC	LC	MC	Total
III	Credit	2	8	4	10	0	0	0	0	24

Fourth Semester

Year	Semester	S. No.	Course Code	Course Title	Subject	Credits	Contacts Hours/Week	Total Marks	CA	EoSE

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						L	T	P	Total		Max. Marks	Min. Marks	Midterm Test Duration	Max. Marks	Min. Marks	Duration
2	IV	1	CCT-64T-HSMC-202	Entrepreneurship	HSMC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	IV	2	CCT-64T-BSC-205	Solid State Physics	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	IV	3	CCT-64T-BSC-206	Quantum Chemistry	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	IV	4	CCT-64T-BSC-207	Numerical Methods	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	IV	5	CCT-64T-BSC-208	Bio-Statistics	BSC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	IV	6	CCT-64T-PCC-204	Microbiology	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	IV	7	CCT-64T-PCC-205	Database Management System	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
2	IV	8	CCT-64T-PCC-206	System Analysis and Design	PCC	**2**	2	0	0	**2**	50	15	4	1	60	16	3
2	IV	9	CCT-64P-PCC-223	Microbiology Lab	PCC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
2	IV	10	CCT-64P-ESC-222	Engineering Drawing Lab	ESC	**2**	0	0	4	**4**	50	15	4	2	60	16	4
2	IV	11	CCT-64P-ESC-223	LAMP Project Lab	ESC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
2	IV	12	CCT-64F-MC-202	Constitution of India	MC	**0**	0	0	0	**0**							
						22	**16**	**0**	**12**	**28**							

Semester	Category	HSMC	BSC	ESC	PCC	PEC	OEC	LC	MC	Total
IV	**Credit**	**2**	**8**	**4**	**8**	**0**	**0**	**0**	**0**	**22**

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Fifth Semester

Year	Semester	S. No.	Course Code	Course Title	Subject Area	Credits	Contacts Hours/Week				Total Marks	CA			EoSE		
							L	T	P	Total		Max. Marks	Min. Marks	Midterm Test Duration	Max. Marks	Min. Marks	Duration
3	V	1		HSMC Elective 1	HSMCE	**2**	2	0	0	**2**	50	10	4	1	40	16	3
3	V	2	CCT-75T-PCC-301	Introduction to Nanotechnology	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
3	V	3	CCT-75T-PCC-302	Introduction to Nano-electronics	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
3	V	4	CCT-75T-PCC-303	Recombinant DNA Technology	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
3	V	5	CCT-75T-PCC-304	Introduction to Bio-informatics	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
3	V	6	CCT-75T-PCC-305	Artificial Intelligence	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
3	V	7	CCT-75T-PCC-306	Functional Programming Language	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
3	V	8	CCT-75T-PCC-307	Introduction to Cognitive Science	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
3	V	9	CCT-75T-PCC-308	Introduction to Neuroscience	PCC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
3	V	10	CCT-75P-PCC-321	Nano Synthesis Laboratory	PCC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
3	V	11	CCT-75P-PCC-322	Recombinant DNA Lab	PCC	**2**	0	0	4	**4**	50	10	4	2	40	16	4

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3	V	12	CCT-75P-PCC-323	Functional Programming Language Lab	PCC	**2**	0	0	4	**4**	50	10	4	2	40	16	4
3	V	13	CCT-75F-MC-301	Anandam-III	MC	**0**	0	0	0	**0**	50				50	20	
						24	**18**	**0**	**12**	**30**							

Semester	Category	HSMCE	BSC	ESC	PCC	PEC	OEC	LC	MC	Total
V	**Credit**	**2**	**0**	**0**	**22**	**0**	**0**	**0**	**0**	**24**

Sixth Semester

Year	Semester	S. No.	Course Code	Course Title	Subject Area	Credits	Contacts Hours/Week				Total Marks	CA			EoSE		
							L	T	P	Total		Max. Marks	Min. Marks	Midterm Test Duration	Max. Marks	Min. Marks	Duration
3	VI	1		HSMC Elective 2	HSMC	2	2	0	0	**2**	50	10	4	1	40	16	3
3	VI	2	CCT-76T-PCC-309	Synthesis and Characterization of Nanomaterials	PCC	2	2	0	0	**2**	50	10	4	1	40	16	3
3	VI	3	CCT-76T-PCC-310	Nano-Photonics	PCC	2	2	0	0	**2**	50	10	4	1	40	16	3
3	VI	4	CCT-76T-PCC-311	Metabolic Engineering	PCC	2	2	0	0	**2**	50	10	4	1	40	16	3
3	VI	5	CCT-76T-PCC-312	Omics Science	PCC	2	2	0	0	**2**	50	10	4	1	40	16	3
3	VI	6	CCT-76T-PCC-313	Basic of Quantum Computing	PCC	2	2	0	0	**2**	50	10	4	1	40	16	3

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3	VI	7	CCT-76T-PCC-314	Transmission Control Protocol / Internet Protocol	PCC	2	2	0	0	**2**	50	10	4	1	40	16	3
3	VI	8	CCT-76T-PCC-315	Cognitive Neurology	PCC	2	2	0	0	**2**	50	10	4	1	40	16	3
3	VI	9	CCT-76T-PCC-316	Brain Mapping & Engineering	PCC	2	2	0	0	**2**	50	10	4	1	40	16	3
3	VI	10	CCT-76P-PCC-324	Nanomaterial Synthesis Lab	PCC	2	0	0	4	**4**	50	10	4	2	40	16	4
3	VI	11	CCT-76P-PCC-325	Bioinformatics Lab	PCC	2	0	0	4	**4**	50	10	4	2	40	16	4
3	VI	12	CCT-76P-PCC-326	MATLAB/SCILAB Programming Lab	PCC	2	0	0	4	**4**	50	10	4	2	40	16	4
3	VI	13	CCT-76F-MC-302	Indian Knowledge System	MC	0	0	0	0	**0**	50				50	20	
						24	**18**	**0**	**12**	**30**							

Semester	Category	HSMCE	BSC	ESC	PCC	PEC	OEC	LC	MC	Total
VI	Credit	2	0	0	22	0	0	0	0	24

Seventh Semester

Year	Semester	S. No.	Course Code	Course Title	Subject Area	Credits	L	T	P	Total	Total Marks	Max. Marks	Min. Marks	Midterm Test Duration	Max. Marks	Min. Marks	Duration
4	VII	1		HSMC Elective 3	HSMC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
4	VII	2		Four Electives from Nano/Bio/Info/Cogno Group as Major	PEC	**4x3 = 12**	12	0	0	**12**	50	10	4	1	40	16	3

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4	VII	3		Two Electives Lab from Nano/Bio/Info/Cogno Group as Major	PEC	**2 x 2 = 4**	0	0	8	**8**	50	10	4	1	40	16	3
4	VII	4		Two Elective from Nano/Bio/Info/Cogno Group as Minor other than Major	OEC	**2x3=6**	6	0	0	**6**	50	10	4	1	40	16	3
4	VII	5		One Elective Lab from Nano/Bio/Info/Cogno Group as a Minor other than Major	OEC	**2**	0	0	4	**4**	50	10	4	1	40	16	3
4	VII	6	CCT-89F-LC-401	NBIC Research Review Project	LC	**4**	0	0	0	**0**	50	10	4	2	40	16	4
						30	**20**	**0**	**12**	**32**							

Semester	**Category**	**HSMCE**	**BSC**	**ESC**	**PCC**	**PEC**	**OEC**	**LC**	**MC**	**Total**
VII	**Credit**	**2**	**0**	**0**	**0**	**16**	**8**	**4**	**0**	**30**

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Eighth Semester

Year	Semester	S. No.	Course Code	Course Title	Subject Area	Credits	L	T	P	Total	Total Marks	Max. Marks	Min. Marks	Midterm Test Duration	Max. Marks	Min. Marks	Duration
4	VIII	1		HSMC Elective 4	HSMC	**2**	2	0	0	**2**	50	10	4	1	40	16	3
4	VIII	2		Four Electives from Nano/Bio/Info/Cogno Group as Major	PEC	**4x3 = 12**	12	0	0	**12**	50	10	4	1	40	16	3
4	VIII	3		Two Electives Lab from Nano/Bio/Info/Cogno Group as Major	PEC	**2 x 2 = 4**	0	0	8	**8**	50	10	4	1	40	16	3
4	VIII	4		Two Elective from Nano/Bio/Info/Cogno Group as Minor other than Major	OEC	**2x3=6**	6	0	0	**6**	50	10	4	1	40	16	3
4	VIII	5		One Elective Lab from Nano/Bio/Info/Cogno Group as a Minor other than Major	OEC	**2**	0	0	4	**4**	50	10	4	1	40	16	3
4	VIII	6	CCT-89F-LC-402	Review of Research Papers	LC	**2**	0	0	0	**0**	50	10	4	2	40	16	4
4	VIII	7	CCT-89I-LC-403	SUMMER INTERNSHIP	LC	**10**											
						28/38	**20**	**0**	**12**	**32**							

Semester	Category	HSMCE	BSC	ESC	PCC	PEC	OEC	LC	MC	Total

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VIII	Credit	2	0	0	0	16	8	2+10	0	28+10

Note: If a student wishes to exit, he/she has to complete the summer internship of 300 hours = 10 credits for other students it is optional

Ninth Semester

Year	Semester	S. No.	Course Code	Course Title	Subject Area	Credits	L	T	P	Total	Total Marks	Max. Marks	Min. Marks	Midterm Test Duration	Max. Marks	Min. Marks	Duration
5	IX	1		Three Electives from Nano/Bio/Info/Cogno Group as Major	PE	**3x3 = 9**	9	0	0	**9**	50	10	4	1	40	16	3
5	IX	2		one Electives Lab from Nano/Bio/Info/Cogno Group as Major	PE	**2**	0	0	4	**4**	50	10	4	1	40	16	3
5	IX	3		One Elective from Nano/Bio/Info/Cogno Group as a Minor other than Major	OE	**3**	3	0	0	**3**	50	10	4	1	40	16	3
5	IX	4		One Elective Lab from Nano/Bio/Info/Cogno Group as a Minor other than Major	OE	**2**	0	0	4	**4**	50	10	4	1	40	16	3
5	IX	5	CCT-89F-LC-501	IPR, Innovation and Case Study	LC	**4**	0	0	8	**8**	50	10	4	2	40	16	4
						20	**12**	**0**	**16**	**28**							

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Semester	Category	HSMCE	BSC	ESC	PCC	PEC	OEC	LC	MC	Total
IX	Credit	0	0	0	0	11	5	4	0	20

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Tenth Semester

Year	Semester	S. No.	Course Code	Course Title	Subject Area	Credits	L	T	P	Total	Total Marks	Max. Marks	Min. Marks	Midterm Test Duration	Max. Marks	Min. Marks	Duration
5	X	1	CCT-8XI-LC-502	Internship/Industrial Training	LC	**20**	0	0	0	**20**							
						20	0	0	0	**20**							

Semester	HSMC	BSC	ESC	PCC	PEC	OEC	LC	MC	Total
I	**2**	**14**	**8**	**0**	**0**	**0**	**0**	**0**	**24**
II	**2**	**14**	**8**	**0**	**0**	**0**	**0**	**0**	**24**
III	**2**	**8**	**4**	**10**	**0**	**0**	**0**	**0**	**24**
IV	**2**	**8**	**4**	**8**	**0**	**0**	**0**	**0**	**22**
V	**2**	**0**	**0**	**22**	**0**	**0**	**0**	**0**	**24**
VI	**2**	**0**	**0**	**22**	**0**	**0**	**0**	**0**	**24**
VII	**2**	**0**	**0**	**0**	**16**	**8**	**4**	**-**	**30**
VIII	**2**	**0**	**0**	**0**	**16**	**8**	**2+10**	**-**	**28+10**
	16	**44**	**24**	**62**	**32**	**16**	**6+10**	**-**	**200+10**
IX	**0**	**0**	**0**	**0**	**11**	**5**	**4**	**0**	**20**
X	**0**	**0**	**0**	**0**	**0**	**0**	**20**	**0**	**20**
	16	**44**	**24**	**62**	**43**	**21**	**30**	**0**	**240**

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GENERAL COURSE STRUCTURE & THEME

A. Definition of Credit:

1 Hr. Lecture (L) per week	1 Credit
1 Hr. Tutorial (T) per week	1 Credit
2 Hours Practical (P) per week	1 Credit

B. Credits: For Four-year B.Tech. degree program in Converging Technology candidates are required to earn a total of 210 credits. For Dual Degree B.Tech.-M.Tech. in converging Technology candidates are required to earn a total of 240 credits.

C. Structure of UG Program The structure of B.Tech. and Dual Degree B. Tech.-M.Tech. program in Converging Technology shall have essentially the following categories of courses with the breakup of credits as given:

S.No.	Category	Credit Breakup for B. Tech.	Credit Breakup for Dual Degree B. Tech.-M.Tech.
1	Humanities and Social Sciences including Management courses	16	16
2	Basic Science courses	44	44
3	Engineering Science courses including workshop, drawing, basics of electronics/electrical/mechanical/compute r etc.	24	24
4	Professional core courses	62	62
5	Professional Elective courses relevant to chosen specialization/branch	32	43
6	Open subjects – Electives from other technical and /or emerging subjects	16	21
7	Project work, seminar and internship in industry or elsewhere	16	30
8	Mandatory Courses [Environmental Sciences, Induction Program, Indian Constitution, Essence of Indian Knowledge Tradition]	(non-credit)	(non-credit)
	Total	**210**	**240**

D. Course code and definition:

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Course code	Definitions
L	Lecture
T	Tutorial
P	Practical
C	Credits
BSC	Basic Science Courses
ESC	Engineering Science Courses

Category Code	Category
HSMC	Humanities and Social Sciences including Management courses
PCC	Professional core courses
PEC	Professional Elective courses relevant to the chosen specialization/branch
OEC	Open subjects – Electives from other technical and /or emerging subjects
LC	Project work, seminar and internship in industry or elsewhere
MC	Mandatory courses

- **Course level coding scheme:** Three-digit number (odd numbers are for the odd semester courses and even numbers are for even semester courses) used as a suffix with the Course Code for identifying the level of the course. The digit at hundred's place signifies the year in which the course is offered. e.g.
  101, 102 … etc.
  for first year.
  201, 202 …. Etc.
  for second year.
  301, 302 … for
  third year.

- **Category-wise Courses**

HSMC Courses

S. No.	Course Code	Course Name	Credit	Semester

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1.	CCT-51T-HSMC-101	Communication Skills	2	I
2.	CCT-52T-HSMC-102	Scientific Writing	2	II
3.	CCT-63T-HSMC-201	Industrial Economics	2	III
4.	CCT-64T-HSMC-202	Entrepreneurship	2	IV
			12	

HSMC Elective Courses

S. No.	Course Code	Course Name	Credit	Semester
1.	CCT-75T-HSMC-E1	Management for Managers	2	Any Four From V To VIII
2.	CCT-76T-HSMC-E2	Digital Marketing	2	
3.	CCT-87T-HSMC-E2	Cyber Crime and Digital Empowerment	2	
4.	CCT-88T-HSMC-E4	The Social Lens: An Exploration of Sociology	2	
5.	CCT-87T-HSMC-E5	Understanding Indian Society: A Sociological Perspective	2	

BSC Courses

S. No.	Course Code	Course Name	Credit	Semester
1.	CCT-51T-BSC-101	Physics-I	2	**I**
2.	CCT-51T-BSC-102	Chemistry-I	2	**I**
3.	CCT-51T-BSC-103	Mathematics-I	2	**I**
4.	CCT-51T-BSC-104	Genetics	2	**I**
5.	CCT-51P-BSC-121	Physics Lab - I	2	**I**
6.	CCT-51P-BSC-122	Chemistry Lab -I	2	**I**
7.	CCT-51P-BSC-123	Life Sciences Lab	2	**I**
8.	CCT-52T-BSC-105	Physics-II	2	**II**
9.	CCT-51T-BSC-106	Chemistry-II	2	**II**

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S. No.	Course Code	Course Name	Credit	Semester
10.	CCT-52T-BSC-107	Mathematics-II	2	**II**
11.	CCT-52T-BSC-108	Cell Biology	2	**II**
12.	CCT-52P-BSC-124	Physics Lab - II	2	**II**
13.	CCT-52P-BSC-125	Chemistry Lab - II	2	**II**
14.	CCT-52P-BSC-126	Cell Biology Lab	2	**II**
15.	CCT-63T-BSC-201	Quantum Physics	2	III
16.	CCT-63T-BSC-202	Principle and Application of Molecular Spectroscopy	2	III
17.	CCT-63T-BSC-203	Advanced Mathematics	2	III
18.	CCT-63T-BSC-204	Development Biology	2	III
19.	CCT-64T-BSC-205	Solid State Physics	2	IV
20.	CCT-64T-BSC-206	Quantum Chemistry	2	IV
21.	CCT-64T-BSC-207	Numerical Methods	2	IV
22.	CCT-64T-BSC-208	Bio-Statistics	2	IV
			44	

ESC Courses

S. No.	Course Code	Course Name	Credit	Semester
1.	CCT-51T-ESC-101	Programming in C	2	I
2.	CCT-51T-ESC-102	Biochemistry	2	I
3.	CCT-51T-ESC-103	Basic Psychological Processes	2	I
4.	CCT-51P-ESC-121	Programming in C Lab	2	I
5.	CCT-52T-ESC-104	Semiconductor Electronics Devices and Applications	2	II
6.	CCT-52T-ESC-105	Object Oriented Programming	2	II
7.	CCT-52T-ESC-122	Semiconductor Electronics Lab	2	II
8.	CCT-52P-ESC-123	C++ Programming Lab	2	II
9.	CCT-63T-ESC-201	Programming in Java	2	III
10.	CCT-63P-ESC-221	Java Programming Lab	2	III
11.	CCT-64P-ESC-222	Engineering Drawing Lab	2	IV
12.	CCT-64P-ESC-223	LAMP Project Lab	2	IV
			24	

PCC Courses

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S. No.	Course Code	Course Name	Credit	Semester
1.	CCT-63T-PCC-201	Physics of Materials	2	III
2.	CCT-63P-PCC-202	Molecular Biology	2	III
3.	CCT-63P-PCC-203	Cognitive Psychology	2	III
4.	CCT-63T-PCC-221	Material Science Lab	2	III
5.	CCT-63P-PCC-222	Psychology Lab	2	III
6.	CCT-63T-PCC-204	Microbiology	2	IV
7.	CCT-64T-PCC-205	Database Management System	2	IV
8.	CCT-64T-PCC-206	System Analysis and Design	2	IV
9.	CCT-64T-PCC-223	Microbiology Lab	2	IV
10.	CCT-64T-PCC-207	System Analysis and Design	2	IV
11.	CCT-75T-PCC-301	Introduction to Nanotechnology	2	V
12.	CCT-75T-PCC-302	Introduction to Nano-electronics	2	V
13.	CCT-75T-PCC-303	Recombinant DNA Technology	2	V
14.	CCT-75T-PCC-304	Introduction to Bio-informatics	2	V
15.	CCT-75T-PCC-305	Artificial Intelligence	2	V
16.	CCT-75T-PCC-306	Functional Programming Language	2	V
17.	CCT-75T-PCC-307	Introduction to Cognitive Science	2	V
18.	CCT-75T-PCC-308	Introduction to Neuroscience	2	V
19.	CCT-75T-PCC-321	Nano Synthesis Laboratory	2	V
20.	CCT-75P-PCC-322	Recombinant DNA Lab	2	V
21.	CCT-75P-PCC-323	Functional Programming Language Lab	2	V
22.	CCT-76T-PCC-309	Synthesis and Characterization of Nanomaterials	2	VI
23.	CCT-76T-PCC-310	Nano-Photonics	2	VI
24.	CCT-76T-PCC-311	Metabolic Engineering	2	VI
25.	CCT-76T-PCC-312	Omics Science	2	VI
26.	CCT-76T-PCC-313	Basic of Quantum Computing	2	VI
27.	CCT-76T-PCC-314	Transmission Control Protocol / Internet Protocol	2	VI
28.	CCT-76T-PCC-315	Cognitive Neurology	2	VI
29.	CCT-76T-PCC-316	Brain Mapping & Engineering	2	VI
30.	CCT-76T-PCC-324	Nanomaterial Synthesis Lab	2	VI
31.	CCT-76P-PCC-325	Bioinformatics Lab	2	VI
32.	CCT-76P-PCC-326	MATLAB/SCILAB Programming	2	VI
			64	

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PEC Courses

S. No.	Course Code	Course Name	Credit	Semester	Group
1.	CCT-87T- PEC-401N	Optoelectronics Devices	3	VII	Nano
2.	CCT-87T- PEC-402N	Polymer Engineering	3	VII	
3.	CCT-87T- PEC-403N	Computational Nanotechnology	3	VII	
4.	CCT-87T- PEC-404N	Nanocomposites	3	VII	
5.	CCT-87T- PEC-421N	Nanomaterial Fabrication and Characterization Lab	2	VII	
6.	CCT-87T- PEC-422N	Computational Nanotechnology Lab	2	VII	
7.	CCT-87T- PEC-401B	Agriculture Biotechnology	3	VII	Bio
8.	CCT-87T- PEC-402B	Bioprocess Engineering and Technology	3	VII	
9.	CCT-87T- PEC-402B	Bioinformatics	3	VII	
10.	CCT-87T- PEC-402B	Molecular Biotechnology	3	VII	
11.	CCT-87T- PEC-421B	Biotechnology Lab	2	VII	
12.	CCT-87T- PEC-422B	Bioinformatics Lab	2	VII	
13.	CCT-87T- PEC-401I	Computer Graphics	3	VII	Info
14.	CCT-87T- PEC-402I	Optical Fiber Communication	3	VII	
15.	CCT-87T- PEC-402I	Design and Analysis of Algorithm	3	VII	
16.	CCT-87T- PEC-402I	Machine Learning	3	VII	
17.	CCT-87T- PEC-421B	Algorithm Implementation Lab	2	VII	
18.	CCT-87T- PEC-422B	Server Installation and Configuration Lab	2	VII	
19.	CCT-87T- PEC-401C	Philosophy of Mind	3	VII	Cogno
20.	CCT-87T- PEC-402C	Principles & Techniques of Neuroscience	3	VII	
21.	CCT-87T- PEC-402C	Introduction to Dynamical Systems for Neuroscience	3	VII	
22.	CCT-87T- PEC-402C	Introduction to Computational Neuroscience	3	VII	
23.	CCT-87T- PEC-421C	Cognitive Lab	2	VII	
24.	CCT-87T- PEC-422C	Neurosciences Lab	2	VII	
25.	CCT-88T- PEC-405N	Molecular Nanoelectronics	3	VIII	Nano
26.	CCT-88T- PEC-406N	Nano Devices and Nano Sensors	3	VIII	
27.	CCT-88T- PEC-407N	Application of Nanosciences	3	VIII	
28.	CCT-88T- PEC-408N	Advanced Material Characterization	3	VIII	

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S. No.	Course Code	Course Name	Credit	Semester	Group
29.	CCT-88T- PEC-423N	Nanocomposite Lab	2	VIII	
30.	CCT-88T- PEC-424N	Microscopy and Diffraction Lab	2	VIII	
31.	CCT-88T- PEC-405B	Animal Cell Culture	3	VIII	Bio
32.	CCT-88T- PEC-406B	Proteomics	3	VIII	
33.	CCT-88T- PEC-407B	Chemo Bioinformatics & Drug Designing	3	VIII	
34.	CCT-88T- PEC-408B	Advanced Immunology	3	VIII	
35.	CCT-88T- PEC-423B	Animal Cell Culture Lab	2	VIII	
36.	CCT-88T- PEC-424B	Computational Biology Lab	2	VIII	
37.	CCT-88T- PEC-405I	Microwave Communication	3	VIII	Info
38.	CCT-88T- PEC-406I	Network Security and Cryptography	3	VIII	
39.	CCT-88T- PEC-407I	Parallel Computing	3	VIII	
40.	CCT-88T- PEC-408I	Network Security Lab	3	VIII	
41.	CCT-88T- PEC-423I	Artificial Intelligence Lab	2	VIII	
42.	CCT-88T- PEC-424I	Techniques in Artificial Intelligence	2	VIII	
43.	CCT-88T- PEC-405C	Sensation and Perception	3	VIII	Cogno
44.	CCT-88T- PEC-406C	Psycho Neurolinguistics	3	VIII	
45.	CCT-88T- PEC-407C	Clinical Neuroscience	3	VIII	
46.	CCT-88T- PEC-408C	Neuroimaging and Cognition	3	VIII	
47.	CCT-88T- PEC-423C	Neurolinguistics Lab	2	VIII	
48.	CCT-88T- PEC-424C	Brain Imaging Lab	2	VIII	
49.	CCT-89T- PEC-501N	Quantum Transport	3	IX	Nano
50.	CCT-89T- PEC-502N	Soft Matter Physics	3	IX	
51.	CCT-89T- PEC-503N	Carbon Nanotechnology	3	IX	
52.	CCT-89T- PEC-521N	Advanced Nanomaterials Lab	2	IX	
53.	CCT-89T- PEC-501B	Food Biotechnology	3	IX	Bio
54.	CCT-89T- PEC-502B	Industrial Biotechnology	3	IX	
55.	CCT-89T- PEC-503B	Advance Tool and Technique	3	IX	
56.	CCT-89T- PEC-521B	Advanced Biotechnology Lab	2	IX	
57.	CCT-89T- PEC-501I	Digital Communication and Signal Processing	3	IX	Info
58.	CCT-89T- PEC-502I	Operating System Engineering	3	IX	
59.	CCT-89T- PEC-503I	Advanced Informatics Lab	3	IX	
60.	CCT-89T- PEC-521I	Mobile & Pervasive Computing	2	IX	

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S. No.	Course Code	Course Name	Credit	Semester	Group
61.	CCT-89T- PEC-501C	Neuropharmacology and Neurotoxicology	3	IX	Cogno
62.	CCT-89T- PEC-502C	Neurological and Psychiatric Disorders	3	IX	
63.	CCT-89T- PEC-503C	Computational and Modelling in Neuroscience	3	IX	
64.	CCT-89T- PEC-521C	Advanced Cognitive Science Lab	2	IX	

OEC Courses

S. No.	Course Code	Course Name	Credit	Semester	Group
1.	CCT-87T- PEC-401N	Optoelectronics Devices	3	VII	Nano
2.	CCT-87T- PEC-402N	Polymer Engineering	3	VII	
3.	CCT-87T- PEC-403N	Computational Nanotechnology	3	VII	
4.	CCT-87T- PEC-404N	Nanocomposites	3	VII	
5.	CCT-87P- PEC-421N	Nanomaterial Fabrication and Characterization Lab	2	VII	
6.	CCT-87P- PEC-422N	Computational Nanotechnology Lab	2	VII	
7.	CCT-87T- PEC-401B	Agriculture Biotechnology	3	VII	Bio
8.	CCT-87T- PEC-402B	Bioprocess Engineering and Technology	3	VII	
9.	CCT-87T- PEC-402B	Bioinformatics	3	VII	
10.	CCT-87T- PEC-402B	Molecular Biotechnology	3	VII	
11.	CCT-87P- PEC-421B	Biotechnology Lab	2	VII	
12.	CCT-87P- PEC-422B	Bioinformatics Lab	2	VII	
13.	CCT-87T- PEC-401I	Computer Graphics	3	VII	Info
14.	CCT-87T- PEC-402I	Optical Fiber Communication	3	VII	
15.	CCT-87T- PEC-402I	Design and Analysis of Algorithm	3	VII	
16.	CCT-87T- PEC-402I	Machine Learning	3	VII	
17.	CCT-87P- PEC-421B	Algorithm Implementation Lab	2	VII	
18.	CCT-87P- PEC-422B	Server Installation and Configuration Lab	2	VII	
19.	CCT-87T- PEC-401C	Philosophy of Mind	3	VII	Cogno
20.	CCT-87T- PEC-402C	Principles & Techniques of Neuroscience	3	VII	

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S. No.	Course Code	Course Name	Credit	Semester	Group
21.	CCT-87T- PEC-402C	Introduction to Dynamical Systems for Neuroscience	3	VII	
22.	CCT-87T- PEC-402C	Introduction to Computational Neuroscience	3	VII	
23.	CCT-87P- PEC-421C	Cognitive Lab	2	VII	
24.	CCT-87P- PEC-422C	Neurosciences Lab	2	VII	
25.	CCT-88T- PEC-405N	Molecular Nanoelectronics	3	VIII	Nano
26.	CCT-88T- PEC-406N	Nano Devices and Nano Sensors	3	VIII	
27.	CCT-88T- PEC-407N	Application of Nanosciences	3	VIII	
28.	CCT-88T- PEC-408N	Advanced Material Characterization	3	VIII	
29.	CCT-88P- PEC-423N	Nanocomposite Lab	2	VIII	
30.	CCT-88P- PEC-424N	Microscopy and Diffraction Lab	2	VIII	
31.	CCT-88T- PEC-405B	Animal Cell Culture	3	VIII	Bio
32.	CCT-88T- PEC-406B	Proteomics	3	VIII	
33.	CCT-88T- PEC-407B	Chemo Bioinformatics & Drug Designing	3	VIII	
34.	CCT-88T- PEC-408B	Advanced Immunology	3	VIII	
35.	CCT-88P- PEC-423B	Animal Cell Culture Lab	2	VIII	
36.	CCT-88P- PEC-424B	Computational Biology Lab	2	VIII	
37.	CCT-88T- PEC-405I	Microwave Communication	3	VIII	Info
38.	CCT-88T- PEC-406I	Network Security and Cryptography	3	VIII	
39.	CCT-88T- PEC-407I	Parallel Computing	3	VIII	
40.	CCT-88P- PEC-408I	Network Security Lab	3	VIII	
41.	CCT-88P- PEC-423I	Artificial Intelligence Lab	2	VIII	
42.	CCT-88T- PEC-424I	Techniques in Artificial Intelligence	2	VIII	
43.	CCT-88T- PEC-405C	Sensation and Perception	3	VIII	Cogno
44.	CCT-88T- PEC-406C	Psycho Neurolinguistics	3	VIII	
45.	CCT-88T- PEC-407C	Clinical Neuroscience	3	VIII	
46.	CCT-88T- PEC-408C	Neuroimaging and Cognition	3	VIII	
47.	CCT-88P- PEC-423C	Neurolinguistics Lab	2	VIII	
48.	CCT-88P- PEC-424C	Brain Imaging Lab	2	VIII	
49.	CCT-89T- PEC-501N	Quantum Transport	3	IX	Nano
50.	CCT-89T- PEC-502N	Soft Matter Physics	3	IX	
51.	CCT-89T- PEC-503N	Carbon Nanotechnology	3	IX	

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S. No.	Course Code	Course Name	Credit	Semester	Group
52.	CCT-89P- PEC-521N	Advanced Nanomaterials Lab	2	IX	
53.	CCT-89T- PEC-501B	Food Biotechnology	3	IX	Bio
54.	CCT-89T- PEC-502B	Industrial Biotechnology	3	IX	
55.	CCT-89T- PEC-503B	Advanced Tool and Technique	3	IX	
56.	CCT-89P- PEC-521B	Advanced Biotechnology Lab	2	IX	
57.	CCT-89T- PEC-501I	Digital Communication and Signal Processing	3	IX	Info
58.	CCT-89T- PEC-502I	Operating System Engineering	3	IX	
59.	CCT-89T- PEC-503I	Advanced Informatics Lab	3	IX	
60.	CCT-89P- PEC-521I	Mobile & Pervasive Computing	2	IX	
61.	CCT-89T- PEC-501C	Neuropharmacology and Neurotoxicology	3	IX	Cogno
62.	CCT-89T- PEC-502C	Neurological and Psychiatric Disorders	3	IX	
63.	CCT-89T- PEC-503C	Computational and Modelling in Neuroscience	3	IX	
64.	CCT-89P- PEC-521C	Advanced Cognitive Science Lab	2	IX	

Mandatory Courses

S. No.	Course Code	Course Name	Credit	Semester
1.	CCT-51F-MC-101	Anandam-I	0	I
2.	CCT-52T-MC-102	Environmental Studies	0	II
3.	CCT-63F-MC-201	Anandam-II	0	III
4.	CCT-64T-MC-202	Constitution of India	0	IV
5.	CCT-75F-MC-301	Anandam-III	0	V
6.	CCT-76T-MC-302	Indian Knowledge System	0	VI

E. Evaluation Scheme

a. **For Theory Courses:**
(The weightage of Internal assessment is 20% and for End Semester Exam is 80%) The student has to obtain at least 40% marks individually both in internal assessment and end-semester exams to pass.

b. **For Practical Courses:**
(The weightage of Internal assessment is 20% and for End Semester Exam is 80%) The student has to obtain at least 40% marks individually both in

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internal evaluation and end-semester exams to pass.

c. **For Summer Internship / Projects / Seminar etc.**
Evaluation is based on work done, report quality, performance in viva voce, presentation etc.

Note: The internal assessment is based on the student's performance in mid-semester tests, quizzes, assignments, class performance, attendance, viva voce in practical, lab record etc.

F. Mapping of Marks to Grades

The mapping of marks to grades may be done as per the following table:

Range of Marks	Assigned Grade
91-100	A^+
81-90	A
71-80	B^+
61-70	B
51-60	C^+
46-50	C
40-45	D
< 40	F (Fail due to less marks)
-	F^R (Fail due to shortage of attendance and therefore, to repeat the course)

G. Exit Policy:

a) After Second Year:
Students who opt to exit after completion of the Second year and have secured 100 credits will be awarded a **Diploma in Converging Technology** if, in addition, they complete one internship of 6 credits (180 hours) during the summer vacation of the Second year.

b) After Third Year:
Students who opt to exit after completion of the Third year and have secured 180 credits will be awarded a **B.Voc. (Converging Technologies)** if, in addition, they complete one internship of 6 credits (180 hours) during the summer vacation of the Second year.

c) After Fourth Year:

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Students who opt to exit after completion of the Third year and have secured 180 credits will be awarded a **B.Tech. (Converging Technologies)** if, in addition, they complete one internship of 10 credits (300 hours) during the summer vacation of the Fourth year.

H. Computation of SGPA and CGPA:

The Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA) are calculated to measure students' overall performance. The SGPA is computed for each semester by taking the weighted average of the grade points earned in that particular semester, while the CGPA is calculated by considering the weighted average of grade points across all semesters. These indicators provide a comprehensive view of student's academic progress throughout their undergraduate journey.

Semester Grade Point Average (SGPA) and Cumulative Grade Point Average (CGPA):

i. The SGPA is the ratio of the sum of the product of the number of credits with the grade points scored by a student in all the courses taken by a student and the sum of the number of credits in all the courses undergone by a student, i.e.

$$\textbf{SGPA}\ (S_i) = \Sigma(C_i \times G_i) / \Sigma C_i$$

Where C_i is the number of credits of the i^{th} course and G_i is the grade point scored by the student in the i^{th} course.

ii. The Cumulative Grade Point Average (CGPA) is also calculated in the same manner taking into account all the courses undergone by a student over all the semesters of a programme, i.e.

$$\textbf{CGPA} = \Sigma(C_i \times S_i) / \Sigma\ C_i$$

where S_i is the SGPA of the i^{th} semester and C_i is the total number of credits in that semester.

Note –

1. Marks obtained in each course and a weighted average of marks based on marks obtained in all semesters taken together shall be mentioned in the mark sheet.

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2. The Letter grades, Grade Points and SGPA and CGPA shall be issued in the transcript for each semester and a consolidated transcript indicating the performance in all semesters.

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Examination Scheme

1. 1 credit = 25 marks for examination/evaluation
2. For Regular Students there will be Continuous assessment, in which sessional work and the terminal examination will contribute to the final grade. Each course in Semester Grade Point Average (SGPA) has two components- Continuous assessment (20% weightage) and (End of end-semester examination) EoSE (80% weightage).
3. For Regular Students,75% Attendance is mandatory for appearing in the EoSE.
4. To appear in the EoSE examination of a course/subject a regular student must appear in the mid-semester examination and obtain at least a C grade in the course/subject.
5. Credit points in a Course/Subject will be assigned only if, the regular student obtains at least a C grade in the CA and EoSE examination of a Course/Subject.

Examination Scheme for Continuous Assessment (CA)

DISTRIBUTION OF CONTINUOUS ASSESSMENT (CA) MARKS

S. No.	CATEGORY	Weightage (out of total internal marks)		THEORY		PRACTICAL
	Max Internal Marks			**10**	**15**	**10**
1	**Mid-term Exam**	***~50%***		**5**	**8**	**5**
2	**Assignment**	***~25%***		**2.5**	**3.5**	**2.5**
3	**Attendance**	***~25%***		**2.5**	**3.5**	**2.5**
		Regular Class	= 75%	1	2	1
			75-80%	1.5	2.5	1.5
			80-85%	2	3	2
			> 85%	2.5	3.5	2.5

Note:

1. Continuous assessment will be the sole responsibility of the teacher concerned.

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2. For continuous assessment no remuneration will be paid for paper setting, Evaluation, Invigilation etc.
3. For continuous assessment Paper setting and Evaluation responsibility will be of teacher concern.
4. For continuous assessment no Answer sheets/question papers etc. will be provided by the University.
5. Colleges are advised to keep records of continuous assessment, attendance etc.

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SEMESTER-WISE PAPER TITLES WITH DETAILS

DD0401 – Dual Degree B.Tech.-M.Tech. in Converging Technologies								
					Credits			
#	Level	Semester	Type	Title	L	T	P	Total
1.	5	I	HSMC	DD0401-CCT-51T- HSMC-101–Communication Skills	2	0	0	2
2.	5	I	BSC	DD0401-CCT-51T-BSC-101–Physics-I	2	0	0	2
3.	5	I	BSC	DD0401-CCT-51T-BSC-102-Chemistry-I	2	0	0	2
4.	5	I	BSC	DD0401-CCT-51T-BSC-103-Mathematics-I	2	0	0	2
5.	5	I	BSC	DD0401-CCT-51T-BSC-104-Genetics	2	0	0	2
6.	5	I	BSC	DD0401-CCT-51P-BSC-121-Physics Lab - I	2	0	0	2
7.	5	I	BSC	DD0401-CCT-51P-BSC-122-Chemistry Lab -I	2	0	0	2
8.	5	I	ESC	DD0401-CCT-51P-BSC-123-Life Sciences Lab	2	0	0	2
9.	5	I	ESC	DD0401-CCT-51T-ESC-102-Programming in C	2	0	0	2
10.	5	I	ESC	DD0401-CCT-51T-ESC-102-Biochemistry	2	0	0	2
11.	5	I	ESC	DD0401-CCT-51T-ESC-102-Basic Psychological Processes	2	0	0	2
12.	5	I	ESC	DD0401-CCT-51P-ESC-121- Programming in C Lab	0	0	2	2
13.	5	I	MC	DD0401-CCT-51F-MC-101- Anandam-I	0	0	0	2

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Syllabus

CCT-51T- HSMC-101: Communication Skills
I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51T- HSMC-101	Communication Skills				5	2
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	HSMC	2	-	2	No	30 Lectures	
Prerequisites		XII Standard from Central Board of Secondary Education or equivalent.					
Objectives of the Course:		1. To comprehend the basics of communication skills in formal and informal settings. 2. To enhance the student's ability to understand the process of communication and develop effective communication skills. 3. To develop the art of listening among students by identifying barriers and overcome them. 4. To acquire knowledge of the various means of communication and use them precisely. 5. To improve writing skills for clear, concise, and professional communication in emails, reports, letters, and other written documents.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-51T- HSMC-101– Communication Skills	1 Hrs-CA 1 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks
Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

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PART-B: 32 Marks
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

Detailed Syllabus

CCT-51T- HSMC-101: Communication Skills

Unit-I

Introduction to Communication

- Meaning and Definition of Communication
- Purpose and Scope of Communication
- Process of Communication
- Importance of Communication Network

(7 Lectures)

Unit-II

Types of Communication

- Verbal and Non-Verbal Communication
- Oral and Written Communication
- Formal and Informal types of Communication
- Understanding Body Language: KOPPACT (Kinesis, Oculesics, Paralanguage, Proxemics, Artifactics, Chromatics, Tactilics)
- Developing and Maintaining Channels of Communication

(8 Lectures)

Unit-III

Effective Communication and Listening Skills

- Principles of Effective Communication
- Seven Cs of Communication
- Understanding Barriers to Effective Communication
- Listening Process: Types of Listening and Barriers to Listening
- Developing Listening Skills
- Feedback

(8 Lectures)

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Unit-IV

Developing Writing Skills

- Report Writing
- Business Letters
- Preparing Resume and CV
- Presentation Skills

(8 Lectures)

Suggested Books and References:

1. Messages: The Communication Skills Book by Matthew McKay, Martha Davis, Patrick Fanning, New Harbinger Publications.
2. People Skills: How to Assert Yourself, Listen to Others and Resolve Conflicts by Robert Bolton.
3. The Elements of Style by William Strunk Jr. and E.B. White.
4. How to Speak Effectively: A Guide to Engaging Conversations, Presentations, and Making an Impact on People by Patrick King.
5. Writing Skills (The Business Skills Series) by Anne Laws.

Course Learning Outcomes:

1. Define and understand key concepts of Communication clearly in various contexts, including formal presentations and communication.
2. Analyze the significance of the communication process and its various channels to communicate messages with clarity, appropriate tone, and confidence.
3. It will help demonstrate improved listening skills, including paraphrasing, asking clarifying questions, and providing feedback.
4. Understand the techniques of written and digital media communication to improve digital communication professionally, understand etiquette, and maintain clear and effective exchanges.
5. Refine writing skills and equip with better ways of professional writing.

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Syllabus

CCT-51T-BSC-101: Physics-I
I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51T-BSC-101	Physics -I				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	02	-	02	No	Lectures	
Prerequisites		Knowledge of high school physics and basic mathematics					
Objectives of the Course:		The objectives of this course are to provide the fundamental concepts of physics to the students which are useful for applied and engineering physics.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-51T-BSC-101–Physics-I	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks

Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 32 Marks

Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-51T-BSC-101-Physics-I

Unit-I

Units, Physical quantities and vectors, Motion along a straight line, Motion in two or three dimensions, Newton's law of motion, Work and Kinetic energy, Potential energy and energy conservation, Momentum, Impulse and collisions, Rotation of rigid bodies, dynamics of rotational motion

[7 Lectures]

Unit-II

Elasticity: Stress, Strain, Elastic limit, Hook's law, Young's modulus, Bulk modulus, Shear modulus, elasticity and plasticity.
Fluid Mechanics: Pressure in a fluid, Pascal's law, Archimedes's principle, Surface tension, continuity equation, Bernoulli's equation, Viscosity and turbulence
Periodic motion: Simple harmonic motion, Energy in simple harmonic motion, simple pendulum, damped oscillations, forced oscillations and resonances

[8 Lectures]

Unit-III

Temperature and thermal equilibrium, zeroth law of thermodynamics, thermal expansion, specific heat, calorimetry and phase changes, mechanism of heat transfer, equations of state and idea gas equation, heat capacity, the internal energy and the first law of thermodynamics, Kinds of thermodynamic processes, internal energy and heat capacities of an ideal gas, heat engines, refrigerators, Second law of thermodynamics, the Carnot cycle, Entropy

[7 Lectures]

Unit-IV

Interference, conditions for interference, interference by division of wavefront and by division of amplitude, diffraction, Fraunhofer and Fresnel diffraction, Fraunhofer diffraction at the single slit and double slit, diffraction grating, characteristics of diffraction grating and its applications, Polarization, Linear, circular and elliptical polarization, polarization by reflection, refraction and scattering, Laser, Spontaneous and stimulated emission

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[8 Lectures]

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Suggested Books and References:

1. Young and Freedman, University Physics, Pearson.
2. D.S. Mathur, Elements of Properties of Matter, S.Chand Publishing.
3. Eugene Hecht, Optics, Pearson publication, 2017.
4. Ajoy Ghatak, Optics, McGraw Hill Education (Indian Edition), 2017.
5. H.K. Malik and A. K. Singh, Engineering Physics, McGraw Hill Education (Indian Edition), 2018.

Course Learning Outcomes:

After completion of this course, students will be able to:

- Understand the properties of matter such as elasticity, viscosity and surface tension.
- Gain a piece of knowledge about concepts of thermodynamics and also learn about heat engines, refrigerators, Carnot cycle.
- Understand the different phenomena in optics and learn about lasers.

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Syllabus

CCT-51T-BSC-102-Chemistry-I

I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51T-BSC-102	Chemistry-I				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	02	-	02	No	30 Lectures, including diagnostic and formative assessments	
Prerequisites		XII Pass					
Objectives of the Course:		1. To enable students to acquire a skill set that helps them to understand the basics of physical chemistry. 2. To impart an understanding of all the aspect of physical chemistry eg. Solid state, liquid state, electrochemistry, chemical kinetics and colloidal state with heterogeneous equilibria.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-51T-BSC-101–Physics-I	1 Hrs-CA 1 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks

Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 32 Marks

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Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

Detailed Syllabus

CCT-51T-BSC-101-Chemistry-I

UNIT-I

Liquid and Solid State

A) Liquid state:

Intermolecular forces, structure of liquid (a qualitative description), properties of liquid: vapour pressure, viscosity and surface tension and their variation with the temperature.

Liquid crystals: mesomorphic state classification, structure of smectic, nematic and cholesteric liquid crystals.

B) Solid state:

Symmetry of crystal systems Space lattice, unit cell, laws of crystallography: 1) law of constancy of interfacial angles, 2) law of rationality of indices and 3) law of symmetry of crystal systems.

X-ray diffraction by crystals, Bragg's equation. Determination of crystal structure by powder method. Examples-NaCl, CsCl.

(9 Lectures)

UNIT-II

Colloidal state and Heterogenous Equilibrium

A) Colloidal state:

Differences between true and colloidal solution. Classification (lyophilic and lyophobic colloids), preparation, properties (optical and electrical-Tyndall effect, Brownian effect, electrophoresis and electro-osmosis), electrical double layer, coagulation and protective action of colloids, applications of colloids, surfactants, micelles, critical micelle concentration (CMC), method of determination of CMC.

B) Heterogenous equilibrium:

Law of mass action as applied to the decomposition of $CaCO_3$, $CuSO_4.5H_2O$. Phase, Component and Phase rule, Restricted phase rule and One-component system-water and Sulphur, Two-component system-lead and silver systems (desilverasation of lead).

(8 Lectures)

UNIT-III

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Chemical Kinetics and Catalysts

Rate of reaction, Factors influencing the rate of reaction (concentration, temperature, pressure, catalyst), Order and molecularity of complex reactions(no mechanism) mathematical characteristics of simple chemical reaction-zero order, first order and second order and half life. Determination of the order of reaction by differential rate method, integration and half-life method. Experimental methods of chemical kinetics: conductometric, potentiometric methods. Effect of catalyst (using steady-state approximation). Arrhenius equation and its relation with activation energy

(5 Lectures**)**

UNIT-IV

Electrochemistry and Classical thermodynamics

A) Electrolytic and electrochemical cells:

Gibb's free energy and cell potential, Nernst equation, single electrode potential, metal-metal ion electrode, gas electrode, metal-insoluble metal electrodes, oxidation-reduction electrode, determination of EMF of the cell and cell reactions.

B) Classical chemical thermodynamics

Statement of first law of thermodynamics, reversible expansion processes of an ideal gas at constant volume and constant pressure, the relationship between enthalpy(H) and internal energy(U), Enthalpy change of combustion reaction(ΔHcombustion), acidbase neutralization, enthalpy of formation of compounds, Hess's law of constant heat summation and limitations of first law of thermodynamics.

(8 Lectures)

Suggested Books and References–

1. Physical chemistry by P.W. Atkins.
2. Chemical kinetics by Frost and Pearson.
3. Physical chemistry by B.R. Puri, L.R. Sharma and M.S. Pathania.
4. Element of physical chemistry by Lewis & Glasstone.

Course Learning Outcomes:

The prescribed syllabus expects that the students would get exposure to various aspects of physical chemistry in the curriculum more contextually and systematically as they study its various units.

The course will enable the students to:

- Learn about the basics of physical chemistry and its applications.
- Acquire knowledge about the various aspects of classical thermodynamics.
- Understand the role of catalyst kinetics.

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- Learn fundamental concepts of states of matter (liquid and solid state).

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Syllabus

CCT-51T-BSC-103-Mathematics-I

I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51T-BSC-103	MATHEMATICS-I				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	02	-	02	No	30 Lectures	
Prerequisites		Mathematics courses of X Std. of Central Board of Secondary Education or equivalent.					
Objectives of the Course:		The objective of the course is to master the fundamental concepts in each topic area, with an emphasis on understanding, application, and problem-solving.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-51T-BSC-103– Mathematics-I	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks

Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 32 Marks

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Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-51T-BSC-103-Mathematics-I

UNIT-I

Complex Numbers: Definition, real and imaginary parts, complex conjugate, representation of a complex number in a plane, modulus and argument of a complex number, algebra of complex numbers, cube root of unity.

Permutation and Combination: Fundamental principle of counting, factorial notation, permutation mean of P(n,r), and combination mean of C(n,r). Applications of permutation and combination.

(7 Lectures)

UNIT-II

Sequences and Series: Sequence and series (finite and infinite), n^{th} term, arithmetical progression (A.P.), sum of n terms of an A.P., arithmetic mean (G.M.), Geometric progression (G.P.), sum of n terms and infinite terms of a G.P., Geometric mean (G.M.), Harmonic progression (H.P.), Harmonic mean (H.M.), relation between A.M., G.M., H.M., series representation of exponential functions, logarithmic functions, e^x and $\log(1+x)$.

(8 Lectures)

UNIT-III

Matrices and Determinants: Concept of a matrix, Types of matrices, Transpose and adjoint of a matrix, addition, and multiplication of matrices, rank of matrix, elementary row, and column transformations, the inverse of a matrix, solutions of linear equations in two or three variables using the inverse of a matrix, Determinants of a square matrix.

(7 Lectures)

UNIT-IV

Two-Dimensional Co-ordinate Geometry: Cartesian coordinate system, distance, and section formula, condition for collinearity of three points in a plane, equation of a straight-line slope form, intercept form, general form, parallel and perpendicular line, intercept of a line, the angle between two lines, distance of a point from a line.

(8 Lectures)

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Suggested Books and References –

1. Higher Algebra, Hall & Knight, Arihant Publications India Limited, 2019.
2. Problems in Calculus of One Variable, I. A. Maron, CBS Publishers & Distributors, 2000.
3. An Introduction to the Theory of Numbers, Ivan Niven, Herbert S. Zuckerman, Hugh L. Montgomery, 2008.
4. The elements of coordinate geometry, S. L. Loney, London: Macmillan and Co., 1896.
5. Higher Engineering Mathematics, B. S. Grewal, Khanna Publishers, 2012.

Course Learning Outcomes:

The course will enable the students to:

- Understand the definition of complex numbers and distinguish between real and imaginary parts, sequences, and series.
- Apply the fundamental principle of counting, permutations, and combinations.
- Understand and apply properties of matrices and determinants, and solve linear equation systems using a matrix's inverse.
- Understand the cartesian system and analyze parallel and perpendicular lines, intercepts of a line, and angles between two lines.

These outcomes will equip students with a comprehensive understanding of each topic and the ability to solve related mathematical problems effectively.

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Syllabus

CCT-51T- BSC-104-Genetics

I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51T-BSC-104	Genetics					02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	02	-	02	No	30 Lectures, including diagnostic and formative assessments	
Prerequisites		XII Pass					
Objectives of the Course:		1. Understand the principles of Mendelian genetics and their applications. 2. Explore deviations from Mendelian inheritance, including multiple alleles and gene interactions. 3. Study the mechanisms of sex determination, linkage, and recombination. 4. Analyze genetic diseases, pedigree analysis, and population genetics.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-51T-BSC-104–Genetics	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks

Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

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PART-B: 32 Marks

Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

Detailed Syllabus

CCT-51T-BSC-104-Genetics

Unit – I

Mendelian Genetics

- Pre-Mendelian genetic concepts; Concepts of Phenotype and Genotype
- Mendelian experiments on pea plants - Principle of Dominance, segregation, independent assortment
- Monohybrid and Dihybrid Cross, Back cross and Test cross

Multiple Alleles

- Deviations from Mendelism - Incomplete inheritance and Codominance;
- Pleiotropic genes, Multiple alleles, ABO blood groups and Rh factor in Human
- Interaction of genes: Epistasis, complimentary gene, Supplementary gene, duplicate gene

. (8 Lectures)

Unit-II

Sex Determination and Sex-Linked Characteristics

- Sex determination
- Sex linked characteristics
- X-linked color blindness; X-linked Haemophilia
- Dosage compensation

Linkage and recombination

- Concept of Linkage and Crossing over
- Recombination between two genes; recombination frequency
- Linkage Maps

(7 Lectures)

UNIT-III

Bacterial Genetics

- Transformation (Competent cells)

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- Conjugation (Cointegrate Formation and Hfr Cells, Interrupted mating, Time–of–Entry Mapping, F' Plasmid)
- Transduction (Generalized transduction, Specialized Transduction)
- Use in gene mapping.

Chromosome structure

- Prokaryotic and eukaryotic chromosome
- Normal Human Karyotype
- extrachromosomal inheritance
- Chromosomal numerical (aneuploidy, euploidy) and structural (deletions, duplications, translocations and inversions) aberrations

(8 Lectures)

Unit-IV

Genetic Diseases and **Pedigree Analysis**

- Genetic diseases (Down syndrome, Klinefelter syndrome, Turner syndrome color blindness, Hemophilia and Phenylketonuria)
- Symbols used in pedigree studies
- Pedigree analysis for the inheritance pattern of genetic diseases

Population genetics

- Hardy-Weinberg principle
- Extension of H-W principle to multiple alleles and sex-linked alleles.
- Factors affecting Hardy Weinberg Equilibrium.

(7 Lectures)

Suggested Books and References

1. Lewin's Genes XII by Jocelyn E. Krebs, Elliott S. Goldstein, and Stephen T. Kilpatrick
2. Concepts of Genetics, 10th Edition by William S. Klug, Michael R. Cummings, and Michael A. Palladino
3. Genetics: Analysis and Principles, 5th Edition by Robert J. Brooker
4. Human Heredity: Principles and Issues by Michael R. Cummings
5. Principles of Genetics, 8th Edition by Eldon John Gardner
6. Principles of Genetics, 4th Edition by D. Peter Snustad and Michael J. Simmons (Wiley, 2005)
7. Genes IX, 9th Edition by Benjamin Lewin (Jones and Bartlett, 2007)
8. Modern Genetic Analysis by Anthony J.F. Griffiths et al. (Freeman)
9. Genes IX, 9th Edition by Benjamin Lewin (Jones and Bartlett, 2007)

Related Online Contents [MOOC, SWAYAM, NPTEL, Websites etc.]

1. https://onlinecourses.swayam2.ac.in/cec20_bt17/preview
2. https://nptel.ac.in/courses/102/104/102104052/

3. https://bio.libretexts.org/Bookshelves/Genetics/Online_Open_Genetics_(Nickle_and_Barrette-Ng)

Course Learning Outcomes:

After completing this course, the student will be able to:

1. Ability to explain Mendelian and non-Mendelian inheritance patterns.
2. Proficiency in analyzing sex-linked characteristics and chromosomal aberrations.
3. Understanding of bacterial genetics and its role in gene mapping.
4. Skills to perform pedigree analysis and apply the Hardy-Weinberg principle.

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Syllabus

CCT-51P-BSC-121-Physics Lab-I
I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51P-BSC-121	Physics Lab- I				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	-	02	02	No	60 Hours Practical	
Prerequisites		Knowledge of basic physics					
Objectives of the Course:		The objective of this course is to broaden their knowledge of physics concepts and principles, which can serve as a bridge between theory and practice.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Practical	CCT-51P-BSC-121– Physics Lab- I	1 Hrs-CA 4 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The Practical examination Scheme for **Physics Lab- I** should be as follows –

- Two Practical Exercises of 15 Marks each– 30 Marks
- Viva-Voce – 5 Marks
- Record – 5 Marks

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Detailed Syllabus

CCT-51T-BSC-121-Physics Lab-I

1. To study the damping of a compound pendulum and determine the Q of the oscillator including additional electromagnetic damping.
2. To find the M.I. of an unknown body using the Inertia Table.
3. To determine the modulus of rigidity of the wire using Maxwell's needle.
.4. To determine the Young's modulus Y of a beam by bending.
5. To verify the Newton's law of cooling.
6. To study the temperature variation of resistance and determine the temperature coefficient.
7. To determine the thermal conductivity of a given material.
8. To study interference phenomenon using a LASER source.
9. To determine the wavelength of sodium light by Newton's rings apparatus.
10. To determine the wavelength of spectral lines in Mercury light using a transmission grating.

Course Learning Outcomes:

By the end of this course, students will have developed strong fundamental skills in physics practical's, enabling them to design experiments, collect data and analyse results, which helps students to further understand the subject.

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Syllabus

CCT-51P-BSC-122-Chemistry Lab-I
I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51P-BSC-122	Chemistry Lab- I				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	-	02	02	No	Practical's	
Prerequisites		Knowledge of basic Chemistry					
Objectives of the Course:		1. To enable students to acquire a working skill in the laboratory that helps them to understand the basics of laboratory work related to various concepts of physical chemistry. 2. To impart an understanding of all the aspects of physical processes accompanied by chemical processes 3. To enable students to use of advanced methods instead of classical methods by making use of modern instruments in the determination and identification of the given chemical compound.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Practical	CCT-51P-BSC-122– Chemistry Lab- I	1 Hrs-CA 4 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The Practical examination Scheme for **Chemistry Lab- I** should be as follows –

- Two Practical Exercises of 15 Marks each– 30 Marks
- Viva-Voce – 5 Marks
- Record – 5 Marks

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Detailed Syllabus

CCT-51P-BSC-121-Chemistry Lab-I

Experiment No 1: Determination of surface tension by drop weight method Using stalagmometer method.

Experiment- 2: Determination of molecular weight of a given volatile organic liquid by using an ideal gas equation.

Experiment- 3: Determination of the relative viscosity of a given liquid by using an Ostwald viscometer.

Experiment- 4: Conductometric titration of Acetic acid with Sodium hydroxide.
(End-point determination during acid-base titration in the absence of indicator).

Experiment-5: Determination of solubility (the solubility of Benzoic acid in water at different temperatures) and heat of solution.

Experiment- 6: Determination of heat of solution of KNO_3/NH_4Cl. Application of the concepts of specific heat and temperature change in the determination of heat of solution of a water-soluble salt, KNO_3/NH_4Cl.

Experiment- 7: Determination of melting point of given chemical compound.
Application of the concepts of the process of melting of solids like naphthalene, benzoic acid and urea.

Experiment 8: Determination of boiling point of given liquid like methanol, ethanol and cyclohexane.

Experiment- 9: Sublimation of camphor and naphthalene

Experiment-10: Crystallization of phthalic acid and benzoic acid from hot water.

Suggested Books and References:

1. Physical Chemistry Laboratory Manual (An Interdisciplinary Approach) By Amritha Anand and Ramesh Kumari
2. Practical Physical chemistry by Alex Findlay.
3. Practical book of physical chemistry by A.B.Aher, B.O. Aher, J.P. Bapurao, P.A.

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Pathade and V.A. Bairagi.

Course Learning Outcomes:

The prescribed syllabus expects that the students would get exposure to various aspects of physical chemistry in the curriculum more contextually and systematically as they learn by doing.

The course will enable the students to:

- Learn about the basics of physical chemistry and its applications.
- Acquire knowledge about the various aspects of physical processes like melting, boiling etc.
- Understand the role of the concept of sublimation.
- Learn fundamental concepts responsible for surface tension and viscosity.
- This course will help in the development of their interest in research and innovations.

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Syllabus

CCT-51P- BSC-123-Life Sciences Lab
I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51P-BSC-123	Life Sciences Lab				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	-	02	02	No	60 Hours Practical's	
Prerequisites		XII Pass					
Objectives of the Course:		1. Develop problem-solving skills related to monohybrid and dihybrid crosses. 2. Gain practical experience in conducting genetic tests and analyzing genetic traits. 3. Understand the application of the Hardy-Weinberg principle in population genetics.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Practical	CCT-51P-BSC-123– Life Sciences Lab	1 Hrs-CA 4 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The Practical examination Scheme for **Life Sciences Lab** should be as follows –

- Two Practical Exercises of 15 Marks each– 30 Marks
- Viva-Voce – 5 Marks
- Record – 5 Marks

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Detailed Syllabus

CCT-51P-BSC-123- Life Sciences Lab

1. Problems related to mono-hybrid and Dihybrid cross
2. Ishihara Test for colour blindness
3. Pedigree construction and analysis
4. Study of Barr body in the Buccal epithelial cells
5. Genetic diseases (Down syndrome, Klinefelter syndrome, Turner syndrome, Color blindness, Hemophilia and Phenylketonuria)
6. Problems based on Hardy-Weinberg principle
7. Qualitative test for carbohydrate content in food samples
8. Qualitative test for protein content in food samples
9. Qualitative test for lipids in food samples
10. Determine the beer- Lambert's law using copper sulphate solution
11. Determine the effect of temperature on enzyme activity
12. Determine the effect of PH on enzyme action

Course Learning Outcomes:

- Ability to solve genetic problems involving crosses and inheritance patterns.
- Proficiency in conducting and interpreting tests like the Ishihara Test and Barr body analysis.
- Capability to analyze pedigrees and understand the implications of genetic diseases.

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Syllabus

CCT-51T-ESC-101-Programming in C
I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51T-ESC-101	Programming in C				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	ESC	02	-	02	No	30 hours of Lectures, including program development and formative assessments	
Prerequisites		XII Pass					
Objectives of the Course:		1. To learn the detailed step-by-step process of problem to program using a computer 2. To gain an understanding of algorithm and flowchart 3. To develop the ability to write programs using C language 4. To give the concept of data type, control flow, structured data type, functions etc.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-51T-ESC-101– Programming in C	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks

Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

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PART-B: 32 Marks

Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-51T-ESC-101-Programming in C

Unit – I

Introduction and Basic Concepts – Problem to Program process, Introduction to Algorithm, flowchart, History and importance of C, Basic structure of C program, execution of C program, C character set, Tokens, Variables, Data Types, Operators & Expressions, Input & Output Functions

(7 Lectures)

Unit – II

Control Structure - Decision Making and Branching: Introduction, Decision Making with if Statement; Simple if Statement, the if..else Statement, Nested if..else, The else..if Ladder, The Switch statement, The ? : Operator
Looping: Introduction, The while Statement, The do statement, The for statement, Jumping Statements (Break, Continue, goto)

(8 Lectures)

Unit – III

Array & String – One-dimensional Arrays, Reading & Writing of an array, basic array Operations, Example programs- Bubble sort, Selection sort, Linear search, Binary search, Two-dimensional Arrays, Declaration & Initialization of Two-dimensional Arrays, Example programs Multiplication, Strings: Declaring and Initializing String Variables, Reading & Writing of Strings, Arithmetic Operations on Characters, String-handling Functions, Example: sorting of string, string palindrome
Pointers: Introduction, Declaring Pointer Variables, Initialization & accessing a variable through Pointer, its uses

(8 Lectures)

Unit – IV

Functions: Definition of Functions, Syntax, Function Declaration & calling, parameter passing(call by value, call by reference), Category of Functions, Passing Arrays to Functions, Recursion, Storage classes, Command Line Argument
Structures & Union: Introduction, defining a structure & Union, difference between structure & Union, accessing structure members, structure initialization, array of structures

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File Management in C: Introduction, Defining and opening a file, closing a file, Input/output and Error Handling on Files

(8 Lectures)

Suggested Books and References –

1. **Programming in ANSI C,** Balaguruswamy E. (2019), 8th Edition, McGraw Hill Education
2. **Let Us C,**. Kanetkar Y. P.(2019), 16th Edition, BPB Publications
3. **Programming in C,** Dey P., Ghosh M.,(2018), Oxford University Press
4. **The C Programming Language,** Kernighan B.W. and Dennis M. R.(2015), Pearson Education India
5. **Introduction to C Programming,** Thareja R.(2015) , Oxford University Press

Suggested E-resources:

- **https://www.w3schools.com/c/c_intro.php**
- **https://www.programiz.com/c-programming/online-compiler/**

Course Learning Outcomes:

By the end of the Course, Students will be able to:

1. Describe the fundamentals of C programming Language.
2. Apply appropriate Control structures to solve problems.
3. Explain the concept of Arrays, Strings and pointers.
4. Write programs using structure, user-defined functions

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Syllabus

CCT-51T-ESC-102-Biochemistry
I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQ F Level	Credits
I	CCT-51T- ESC-102	Biochemistry				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	ESC	02	-	02	No	30 Lectures, including program development and formative assessments	
Prerequisites		XII Pass					
Objectives of the Course:		1. To understand the structure and function of biomolecules at a chemical level with a biological perspective. 2. To learn about the importance of water, bioenergetics and enzymes in living organisms. 3. To gain an understanding of the metabolic pathway of biomolecules. 4. To comprehend the biosynthetic pathway and interrelationship among biomolecules.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-51T-ESC-102– Biochemistry	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks

Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

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PART-B: 32 Marks

Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-51T-ESC-102-Biochemistry

UNIT-I

The Foundations of Biochemistry: Cellular Foundations, Chemical Foundations, Physical foundations, Genetic foundations and Evolutionary Foundations. Water: Weak interactions in aqueous systems, ionization of water, weak acids and Acid bases, Buffering against pH change. . **(7 Lectures)**

UNIT-II

Biomolecules structure & Function: Amino Acids: Structure, Essential and non-essential types, characteristics, Lambert-Beer's law. Protein: Peptides & proteins, Primary structure, secondary structure, tertiary & quaternary structure, three-dimensional structure of proteins. Carbohydrates: Monosaccharides, disaccharides & polysaccharides. Lipids: Storage lipids, structural lipids.

(8 Lectures)

UNIT-III

Bioenergetics & Enzymes: Principles of Bioenergetics: Bioenergetics & thermodynamics. Enzymes: introduction, Kinetics, Michalis-Menten Equation, Regulatory enzymes, Examples of enzymatic reactions.

(7 Lectures)

UNIT-IV

Metabolism & Biosynthesis: Glycolysis Pathway, fate of pyruvate, Citric Acid Cycle, Acetyl CoA, reactions of Citric Acid cycle. Carbohydrate Biosynthesis in Plants: C3, biosynthesis of starch. Lipid Biosynthesis: Biosynthesis of fatty acids, triacylglycerols. Nitrogen metabolism.

(8 Lectures)

Suggested Books and References:

1. **Biochemistry**, Berg J.M., Tymoczko J.L. and Stryer L. (2011), 7th edition W.H. Freeman and Co. New York.
2. **Principles of Biochemistry**, Nelson, D. C. and Cox, M.M., Lehninger. (2010), 5th edition, W.H. Freeman and Co.

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3. **Biochemistry,** Voet D. and Voet J.D. (2011), 3rd edition, John Wiley and Sons.

Course Learning Outcomes:

By the end of the Course, Students will be able to:

1. Understand fundamental concepts of biochemistry.
2. Apply basic principles of chemistry to biological systems and molecular biology.
3. Correlate various physiological and metabolic events.
4. Better understand the chemical reactions at a molecular level to develop new ways to harness these.
5. Learn the nature and importance of enzymes in living systems
6. Gain insight into the thermodynamics and role of ATP.

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Syllabus

CCT-51T- ESC-103: Basic Psychological Processes
I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51T-ESC-103	Basic Psychological Processes				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	ESC	02	-	02	No	30 Lectures, including diagnostic and formative assessments	
Prerequisites		XII Pass					
Objectives of the Course:		1. To understand the meaning, goals, history and different methods of psychology. 2. To gain an understanding of the meaning, nature and principles of attention, sensation and perception. 3. To learn about the meaning, nature, types and theories of motivation and emotion. 4. To comprehend the definition, types, theories and assessment methods of personality.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-51T-ESC-103– Basic Psychological Processes	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks

Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 32 Marks

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Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-51T-ESC-103-Basic Psychological Processes

Unit – I

Introduction: Definition and Goals of Psychology; Schools of Psychology-Structuralism, Functionalism, Behaviorism, Gestalt and Psychoanalysis; Modern Perspectives-Biological, Psychodynamic, Behavioral, Cognitive, Humanistic, Evolutionary, and Socio-cultural; Methods-Observation, Case Study, Survey and Experimental Method.

(9 Lectures)

Unit – II

Attention, Sensation and Perception: Attention-Meaning and Nature; Sensation-Meaning, Sensory Receptors, Sensory Thresholds, Habituation and Sensory Adaption. Perception-Meaning, Constancies-Size, Shape and Brightness, Gestalt Principles, Factors Influencing Perception.

(7 Lectures)

Unit – III

Motivation and Emotion: Motivation: Meaning and Approaches-Instinct, Drive-Reduction, Arousal, Incentive and Humanistic. Emotion: Elements-Physiology, Expression, and Subjective Experience; Theories-Cannon Bard, James Lange, Schachter – Singer, Opponent-Process Theory.

(8 Lectures)

Unit – IV

Personality: Definition; Type Theories- Sheldon, Kretchmer, and Jung; Trait Theories- Allport, Cattell, McCrae, and Costa; Personality Assessment- Self-report Inventories, Projective Tests and Behavioral Assessments.

(6 Lectures)

Suggested Books and References:

1. **Psychology**, Baron, R.A. & Misra, G. (2016)., New Delhi: Pearson Education India.
2. **Psychology,** Ciccarelli, S.K., White, J.N. & Misra, G. (2022). New Delhi: Pearson Education
3. **Introduction to Psychology**, Okon, Abigail Edem (2019), University of Calabar.

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4. **Introduction to Psychology**, Morgan, C.T., King, R.A., & Schopler, J. (2004) New Delhi: Tata McGraw Hill.
5. **Understanding Psychology**, Kalat, J.W. (2016). New York: Cengage Learning

Course Learning Outcomes:

By the end of the Course, Students will be able to:

1. Develop an understanding of the epistemology of psychology and analyze and appreciate psychology as a science and its biological basis.
2. Analyze and understand the concepts of sensation, attention and perception and their role in day-to-day life.
3. Apply the principles of major concepts of psychology such as motivation and emotion.
4. Develop an understanding of different theories and methods to study personality.

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Syllabus

CCT-51P-ESC-121-Programming in C Lab
I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51P-ESC-121	Programming in C Lab				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	ESC	-	02	02	No	60 Hours Practical	
Prerequisites		Knowledge of basic computer					
Objectives of the Course:		The objectives of this course are to gain hands-on experience in writing, debugging, and optimizing C programs and to develop problem-solving skills through programming in C.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Practical	CCT-51P-ESC-121– Programming in C Lab	1 Hrs-CA 4 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The Practical examination Scheme for **Programming in C Lab** should be as follows –

- Two Practical Exercises of 15 Marks each– 30 Marks
- Viva-Voce – 5 Marks
- Record – 5 Marks

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Detailed Syllabus

CCT-51P-ESC-121-Programming in C Lab

1. Writing and running the basic C-programs and learning about debugging.
2. Write the C- programs with implementing conditional statements (if, else, switch).
3. Write the C-programs for the implementation of loops (for, while, do-while).
4. Write the C-programs based on recursion.
5. Write C-programs to implement sorting algorithms.
6. Write the C-programs for matrix addition, subtraction and multiplication.
7. Write the C-programs to implement the concept of strings and manipulate the strings.
8. Write the C-programs to implement the user-defined functions.
9. Write the C-programs about the implementation of pointers.
10. Write programs in C for implementation of file handling.

Suggested Books and References:

1. How to Program C, Paul Deitel and Harvey Deitel (Pearson Education Asia)
2. Programming in ANSI C, E Balaguruswamy (Tata McGraw Hill).

Course Learning Outcomes:

By the end of this course, students will have developed strong foundational skills in C programming, enabling them to write, debug, and optimize efficient code for a variety of applications. They will also be proficient in implementing loops, arrays, pointers and file handling.

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Syllabus

CCT-51F-MC-101-Anandam-I
I-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
I	CCT-51F-MC-121	Anandam-I				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	MC	-	00	00	No	60 Hours Field Activity	
Prerequisites		Knowledge of basic computer					
Objectives of the Course:		The objectives of this course are to gain hands-on experience in writing, debugging, and optimizing C programs and to develop problem-solving skills through programming in C.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Practical	CCT-51F-MC-101–Anandam-I	1 Hrs-CA 4 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

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SEMESTER-WISE PAPER TITLES WITH DETAILS

DD0401 – Dual Degree B.Tech.-M.Tech. in Converging Technologies								
					Credits			
#	Level	Semester	Type	Title	L	T	P	Total
1.	5	II	HSMC	DD0401-CCT-52T- HSMC-102– Scientific Writing	2	0	0	2
2.	5	II	BSC	DD0401-CCT-52T-BSC-105–Physics-II	2	0	0	2
3.	5	II	BSC	DD0401-CCT-52T-BSC-106-Chemistry-II	2	0	0	2
4.	5	II	BSC	DD0401-CCT-52T-BSC-107-Mathematics-II	2	0	0	2
5.	5	II	BSC	DD0401-CCT-52T-BSC-108-Cell Biology	2	0	0	2
6.	5	II	BSC	DD0401-CCT-52P-BSC-124-Physics Lab - II	0	0	2	2
7.	5	II	BSC	DD0401-CCT-52P-BSC-125-Chemistry Lab -II	0	0	2	2
8.	5	II	ESC	DD0401-CCT-52P-BSC-126-Cell Biology Lab	0	0	2	2
9.	5	II	ESC	DD0401-CCT-52T-ESC-104- Semiconductor Electronics Devices and Applications	2	0	0	2
10.	5	II	ESC	DD0401-CCT-52T-ESC-105- Object Oriented Programming	2	0	0	2
11.	5	II	ESC	DD0401-CCT-52P-ESC-122- Semiconductor Electronics Lab	0	0	2	2
12.	5	II	ESC	DD0401-CCT-52P-ESC-123-C++ Programming Lab	0	0	2	2
13.	5	II	MC	DD0401-CCT-52T-MC-102-Environmental Studies	0	0	0	2

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Syllabus

CCT-52T-HSMC-102-SCIENTIFIC WRITING

II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52T-HSMC-102	Scientific Writing				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	HSMC	02	-	02	No	Lectures	
Prerequisites							
Objectives of the Course:		1. To understand the importance of writing scientifically. 2. To develop the skill of writing for different writing purposes. 3. To acquire the ability to review the available literature					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-52T- HSMC-102– Scientific Writing	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks
Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 32 Marks
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-52T-HSMC-102-SCIENTIFIC WRITING

UNIT-I

Importance and Overview of Scientific Writing

a. Dissertation

b. Research Article/ Scientific paper
c. Review paper
d. Reports

UNIT-II

Components of Scientific Writing

a. Title
b. Abstract
c. Introduction, Rationale and Objectives

d. Review of Literature
e. Methods and Materials

f. Results and Discussion
    i. Writing text with discussion
    ii. Table, Flowcharts, with titles and footnotes
    iii. Graph, diagrams

g. Summary and Conclusion
h. Limitations, Recommendations and Future Scope
i. Bibliography/ References - Different types of writing styles: APA, MLA, Chicago
j. Appendices

UNIT-III

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Writing and presenting a research proposal for grants:

a. Introduction/ Background information
b. Rationale and Importance
c. Pilot study
d. Research proposal
e. Time-frame
f. Outcomes of the study and its implications
g. Budgeting
h. Summary and Conclusions

UNIT-IV

Ethics in Scientific Writing

a. Ethical approval for research
b. Plagiarism in writing and how to avoid it
c. Authorship, conflict of interest
d. Confidentiality in data handling and reporting
e. Responding to comments by reviewer

Suggested Books and References:

1. Hoffman AH. Scientific Writing and Communication: Papers, proposals and presentations (4th edition; 2019). Oxford University Press.
2. Alley M. The Craft of Scientific Writing (4th Edition). Springer.
3. APA, Publication Manual of American Psychological Association, 3rd Edition, Washington, 1984.
4. Cooper HM. Integrating research, A guide for literature review, 2nd Edition, Sage publications, California, 1989.
5. 3. Dunn FV and others, Disseminating Research: Changing profile. Sage Publications, 1994.

Course Learning Outcomes:

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- This course will enable the students to develop the ability to write scientific documents like papers for publication, reports and other documents.
- It will also help them to understand the methods of presenting the data and results of the research.
- It will also make the student aware of ethics in research.

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Syllabus

CCT-52T-BSC-102-Physics-II

II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52T-BSC-105	Physics -II				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	02	-	02	No	Lectures	
Prerequisites		Knowledge of high school physics and basic mathematics					
Objectives of the Course:		The objectives of this course are to provide the fundamental concepts of electromagnetism to the students and to develop a strong foundation in the principles of electromagnetics and their applications in engineering.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-52T-BSC-105– Physics-II	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks
Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 32 Marks
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-52T-BSC-105-Physics-II

Unit-I

Electric Field and potential due to discrete and continuous charge distribution, Electric Field Lines and Flux, Electrostatic energy, Gauss's Law and its Applications, divergence and Gauss divergence theorem, Electric Dipole and Energy Density

[7 Hours]

Unit-II

Magnetic Forces on Moving Charges, The Biot-Savart Law, Ampère's Law, Magnetic Dipole Moments, Faraday's Law of Induction, Lenz's Law, Inductance and Energy in Magnetic Fields, Magnetic Force on a Current Element, Magnetization and Magnetic Materials, Magnetic Boundary Conditions

[8 Hours]

Unit-III

Conductors in Electrostatic Equilibrium, field determination by method of image, Polarization in Dielectrics, Boundary Conditions for Dielectric Materials, Capacitance and Energy Storage in Capacitors, Magnetic Circuits, Inductance and Energy Stored in Magnetic Fields

[7 Hours]

Unit-IV

Electromotive Force (EMF), Lenz's Law, Induced EMF and Inductance, Displacement CurrentDisplacement Current and Continuity Equation, Maxwell's equations in free space, Poynting Theorem and Energy Considerations, wave polarization

[8 Hours]

Suggested Books and References:

1. W. H. Hayt and J. A. Buck, Engineering Electromagnetics, Tata McFraw Hill Education Pvt. Ltd, 2006.
2. Grifiths. D. J, Introduction to Electrodynamics, Prentice Hall, 2007.
3. Purcell. E.M, Electricity and Magnetism Berkley Physics Course, V2, Tata McGraw Hill, 2008.
4. Matthew N.O. Sadiku: Elements of Electromagnetics, Oxford Univ. Press.

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Course Learning Outcomes:

By the end of this course, students will be able to apply fundamental principles of electromagnetics to analyze and solve problems involving electric and magnetic fields. They will understand and utilize Maxwell's equations and related concepts such as Gauss's Law, Faraday's Law, and the Biot-Savart Law in both theoretical and practical contexts.

Syllabus

CCT-52T-BSC-106-Chemistry - II
II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52T-BSC-106	Chemistry -II				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	02	-	02	No	30 hours Lectures	
Prerequisites		Knowledge of high school Chemistry					
Objectives of the Course:		The objective of this paper is to enable students to acquire a skill set that helps them to understand the basics of Organic and Inorganic chemistry. The course aims to impart an understanding of all the aspects of Organic and Inorganic chemistry e.g. bonding and delocalization, stereochemistry, mechanism of organic reactions and reagents with polymer and supramolecular chemistry.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-52T-BSC-106–Chemistry-II	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

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PART-A: 8 Marks
Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 32 Marks
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-52T-BSC-106-Chemistry-II

Unit-I

Basics of general organic Chemistry

Inductive effect, hyperconjugation, electromeric and resonance effects, tautomerism(difference from resonance), aromaticity, Huckel's rule$(4n+2)\pi$.

Homolytic and heterolytic fission, types of reagents(electrophiles and nucleophiles), reactive intermediates (carbocations, carbanions, free radicals, carbene, nitrene and arynes), formal charge.

(8 Hours)

Unit-II

Stereochemistry

Fischer, newman and sawhorse projection formula and their interconversion.

Geometrical isomerism: syn-anti, E/Z-nomenclature, configuration of oximes and alicyclic compounds.

Optical isomerism: optical activity, elements of symmetry, stereogenic centre, enantiomers, R/S- nomenclature, prochirality: homotopic and heterotopic ligands and faces, molecules with two chiral centres, diastereomers, racemic mixture, resolution, inversion and retention.

(7 Hours)

Unit-III

Mechanism of organic reaction and some important reagents

Type of organic reactions and their mechanisms-substitution: free radical, Aliphatic substitution (S_N1,S_N2 & S_Ni), & aromatic electrophilic substitution(activating and deactivating groups and directive influence), addition reaction: electrophilic addition reaction, free radical addition reactions of C=C, Elimination reaction(E1 and E2).

Aceto acetic ester, Malonic ester, Grignard reagent.

(8 Hours)

Unit-IV

Polymer fundamentals

Organic polymers: addition and condensation polymers, their mechanism, Zeigler-natta catalyst, thermosetting and thermoplastic polymers, other polymers: vinyl polymers, polyacrylonitriles, Bakelite and nylon.

Supramolecular chemistry

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supramolecular host-guest interactions, macrocyclic effect.

(7 Hours)

Suggested Books and References:

1. Principles, structures and reactivity; J.E. Huheey, E.A.Keiter, R.L. Keiter & O.K. Medhi; pearson publication.
2. Reaction mechanism in organic chemistry by Mukherjee & Singh.
3. Stereochemistry, conformation and mechanism by P.S.Kalsi(7^{th} edition).
4. Concise inorganic chemistry by J.D.Lee, ELBS.
5. Advanced inorganic chemistry by F.A.Cotton, G.Wilkinson, C.A. Murillo & M.Bochmann

Course Learning Outcomes:

The prescribed syllabus expects that the students would get exposure to various aspects of organic and inorganic chemistry in the curriculum more contextually and systematically as they study its various units.

The course will enable the students to:

- Learn about the basics of organic reactions and their mechanisms.
- Acquire knowledge about the various aspects of polymer chemistry.
- Understand the role of organic reagents in organic synthesis.
- Learn fundamental concepts of supramolecular chemistry.

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Syllabus

CCT-52T-BSC-107-Mathematics-II
II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52T-BSC-107	MATHEMATICS-II				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	02	-	02	No	Lectures (Thirty)	
Prerequisites		Basic knowledge of algebra, trigonometry, and elementary calculus.					
Objectives of the Course:		To develop a deep understanding of calculus concepts and their applications in solving real-world problems.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-52T-BSC-107– Mathematics-II	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks
Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 32 Marks
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-52T-BSC-107-Mathematics-II

UNIT-I

Limits and Continuity: Definition, Rate of Change, Limit, Functions of one variable, function of a function, Rules of finding Limits (simple problems), Continuity, simple examples of discontinues functions.

(7 Lectures)

UNIT-II

Derivatives: Definition, Differentiability, Differentiation by abridged method (simple algebraic and trigonometrical functions), Differentiation rules (sum, difference, product, division of two functions), Partial differentiation of functions of one or two variables.

(8 Lectures)

UNIT-III

Applications of Derivatives: Mean value theorem, Rolle's, Cauchy and Lagrange's theorems, maxima and minima of one variable, indeterminate form: L-Hospital rule, Euler's formula.

(8 Lectures)

UNIT-IV

Integration: integral as the converse of differentiation, indefinite integral, integration by substitution, integration of the product of two functions, definite integrals, properties and problems, substitution in definite integrals.

(7 Lectures)

Suggested Books and References:

1. Calculus by Thomas and Finny, Pearson Education Asia, 1999
2. Advanced Engineering Mathematics by Erwin Kreyszig, Wiley India Pvt. Ltd., 10th Edition, 2011.
3. Calculus: Early Transcendentals by James Stewart, Cengage Learning, 8th Edition, 2015.
4. Thomas' Calculus by George B. Thomas Jr., Maurice D. Weir, Joel R. Hass, Pearson

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Education, 14th Edition, 2018.
5. Differential and Integral Calculus by Richard Courant, Wiley, 2nd Edition, 1988.
6. A Course in Calculus and Real Analysis by Sudhir R. Ghorpade, Balmohan V. Limaye, Springer, 1st Edition, 2006.

Course Learning Outcomes

The course will enable the students to:

- Define key concepts related to limits and continuity, such as rate of change, limit, and types of discontinuities in functions.
- Explain the rules for finding limits and the concept of continuity in mathematical functions.
- Apply the rules of finding limits to solve simple problems involving functions of one variable and functions of a function.
- Analyze different types of discontinuities in functions and determine the points at which functions are not continuous.
- Evaluate limits and determine the continuity of given functions using appropriate rules and methods.

These outcomes will equip students with a comprehensive understanding of each topic and theability to solve related mathematical problems effectively.

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Syllabus

CCT-52T-BSC-108-Cell Biology
II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52T-BSC-108	Cell Biology				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	02	-	02	No	30 Lectures,	
Prerequisites		XII Pass					
Objectives of the Course:		1. To understand the basic architecture and function of cell and cell organelles. 2. To learn about the composition, organization and function of biomembranes in living organisms. 3. To gain an understanding of the membrane trafficking of proteins in membranes and organelles. 4. To comprehend the role of cyclins and checkpoints in the regulation of cell cycle and cell growth.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-52T-BSC-108–Cell Biology	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks
Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 32 Marks

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Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-52T-BSC-108-Cell Biology

UNIT-I

Cells: Introduction & Architecture: Introduction of cells, Organelles of eukaryotic cell: Endoplasmic reticulum, Golgi complex, Plant Vacuoles, Nucleus, Mitochondria, Chloroplasts, Ribosomes, Cytoskeleton: 3 types of filaments, organization, microfilaments, intermediate filaments, microtubules.

. **(7 Lectures)**

UNIT-II

Bio membrane: Structure & Transport: Bio membrane: Composition, organization, Basic function, Overview of Membrane transport, Diffusion: passive diffusion, Active diffusion, membrane proteins mediated transport, Different classes of pumps (ATP powered pumps, Na-/H+ ATPase, Muscle Ca+ ATPase), Co-transport (anti porter and symporter).

(7 Lectures)

UNIT-III

Membrane Trafficking: Moving proteins into membranes and organelles, Translocation of secretory proteins across the ER membranes, insertion, folding and quality control of proteins in ER, Sorting of proteins to mitochondria, Vesicular traffic, Molecular mechanisın of vesicular trafficking.

(7 Lectures)

UNIT-IV

Cell Cycle and Cell Growth Control: Overview of cell cycle, Cell cycle control in mammalian cells: Go, G1, G2, S phase, Checkpoints, Cyclins, cell division: Mitosis, Meiosis, Programmed cell death through apoptosis, Failure of cell cycle checkpoints, Role of p53, Genetic basis of cancer.

(9 Lectures)

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Suggested Books and References –

1. **Molecular Cell Biology**, Lodish H., Berk A., Matsudaira P., Chris A., Kaiser V., Krieger M., Scott M.P., Zipursky L., and Darnell J., (2003) 5th edition. WH Freeman Publication.
2. **The Cell: A Molecular Approach**, Cooper, G.M. and Hausman, R.E., (2009), 7th edition, ASM Press & Sunderland (Washington DC), Sinauer Associates, MA.
3. **Cell and Molecular Biology: Concepts and Experiments,** Karp, G. (2010), 6th Edition. John Wiley & Sons. Inc.

Course Learning Outcomes:

By the end of the Course, Students will be able to:

1. Understand fundamental concepts of cells.
2. Better understand the structure and function of various cell organelles in a eukaryotic cell.
3. Learn the structure and function of biomembranes in living systems.
4. Gain insight into membrane trafficking of proteins in cells.
5. Acquire knowledge about the cell cycle and cell growth regulation in cells.
6. Learn the cell division processes of Mitosis and Meiosis.
7. Understand the role of P53 protein in Cancer.

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Syllabus

CCT-52P-BSC-124-Physics Lab-II
II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52P-BSC-124	Physics Lab- II				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	-	02	02	No	Practical's	
Prerequisites		Knowledge of basic physics					
Objectives of the Course:		The course aims to provide students with hands-on experience in fundamental and advanced concepts of physics, enabling them to apply theoretical knowledge to real-world scenarios.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-52P-BSC-124–Physics Lab-II	1 Hrs-CA 4 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The Practical examination Scheme for **Physics Lab-II** should be as follows –

- Two Practical Exercises of 15 Marks each– 30 Marks
- Viva-Voce – 5 Marks
- Record – 5 Marks

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Detailed Syllabus

CCT-52P-BSC-124-Physics Lab-II

1. To study electromagnetic induction and to verify Faraday's law.
2. Explore Lenz's Law by studying the direction of induced EMF in a coil when a magnetic field changes.
3. Comparison of electromotive forces of two cells using the potentiometer.
4. Verify the Biot-Savart Law by measuring the magnetic field at different distances from a current-carrying conductor.
5. Determination of e/m of electron by Thomson's method.
6. Determine the self-inductance of a coil by Anderson's bridge method.
7. To determine the specific resistance of the material of a wire and to determine the difference between two small resistances using Carey Foster's bridge.
8. Measure the capacitance of a capacitor and determine the dielectric constant of materials.
9. To study the variation of the magnetic field due to a current carrying circular coil along its axis.
10. Study of excitation of normal modes and frequency splitting measurements using a coupled oscillator.

Course Learning Outcomes:

These practicals provide a comprehensive hands-on experience, reinforcing the key concepts of electromagnetism and preparing students for advanced study or professional application in this field.

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Syllabus

CCT-52P-BSC-125-Chemistry Lab- II
II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52P-BSC-125	Chemistry Lab- II				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	-	02	02	No	Practical's	
Objectives of the Course:		The objective of this paper is to enable students to acquire a working skill in the laboratory that helps them understand the basics of laboratory work related to various concepts of Organic chemistry & inorganic chemistry. The course aims to impart an understanding of all the aspects of organic and inorganic processes accompanied by chemical processes.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-52P-BSC-125– Chemistry Lab-II	1 Hrs-CA 4 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The Practical examination Scheme for **Chemistry Lab-II** should be as follows –

- Two Practical Exercises of 15 Marks each– 30 Marks
- Viva-Voce – 5 Marks
- Record – 5 Marks

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Detailed Syllabus

CCT-52P-BSC-125-Chemistry Lab- II

Experiment-1: Determination of one functional group in a given compound.
Experiment-2: Determination of two functional groups in a given compound.
Experiment-3: Estimation of hardness of water by EDTA.
Experiment-4: Estimation of copper by using thiosulphate by the iodometric method.
Experiment-5: Determination of alkali content in antacid tablet by using HCl.
Experiment-6: Determination of acetic acid in commercial vinegar using NaOH.
Experiment-7: Estimation of Ferrous and ferric by dichromate/permanganate method.
Experiment-8: Estimation of Calcium content in chalk as calcium oxalate by permangnometry.
Experiment-9: To study reaction kinetics of decomposition of H_2O_2 by iodide.
Experiment-10 : Determine the specific rate of reaction of the hydrolysis of ethyl acetate catalyzed by hydrogen ions at room temperatures.

Suggested Books and References–

1. Laboratory Manual of Organic Chemistry by Raj K Bansal
2. Advanced practical physical chemistry by N K Vishnoi**.**
3. Organic lab manual by S K Sinha.
4. Inorganic lab manual by S. Mumazuddin & S K Sinha.

Course Learning Outcomes:

The prescribed syllabus expects the students would get exposure to various aspects of physical chemistry in the curriculum more contextually and systematically as they learn by doing.
The course will enable the students to:

- Learn about the basics of organic and inorganic chemistry and its applications.
- Acquire knowledge about the various aspects of organic processes
- Understand the role of the concept of decomposition and hydrolysis.
- Learn fundamental concepts responsible for functional group detection.
- This course will help in the development of their research interest.

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Syllabus

CCT-52P-BSC-126-Cell Biology Lab

II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52P-BSC-126	Cell Biology Lab				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	BSC	00	02	02	No	60 hours practical	
Prerequisites		XII Pass					
Objectives of the Course:		1. To learn & develop skills and hands-on training in the basics of cell biology. 2. To understand various cellular and sub-cellular components. 3. To develop a systematic approach towards the organization and composition of biomembranes as well as histochemical localization of biomolecules in cells. 4. To gain an understanding of the various cell stages of mitosis and meiosis in specimens. 5. To emphasize on the use of advanced methods instead of classical methods in experiments.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-52P-BSC-125– Cell Biology Lab	1 Hrs-CA 4 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The Practical examination Scheme for **Cell Biology Lab** should be as follows –

- Two Practical Exercises of 15 Marks each– 30 Marks

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- Viva-Voce – 5 Marks
- Record – 5 Marks

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Detailed Syllabus

CCT-52P-BSC-126-Cell Biology Lab

1. Study of electron microphotographs of various cell organelles.
2. Study of plant cell structure from Onion.
3. Study of animal cell structure from cheek cells.
4. Study of electron microphotographs of viruses, bacteria and eukaryotic cells for comparative study of cellular organization.
5. Study of plastid for pigment distribution in Tomato, Cassia and Capsicum.
6. Study of divisional stages in mitosis from onion root tips.
7. Study of divisional stages in meiosis in grasshopper testes/onion or Rhoeo flower buds.
8. Effect of temperature on membrane permeability of beetroot.
9. Effect of different solvents on membrane permeability of beetroot
10. Histochemical localization of protein, carbohydrate, fats, starch and lignin.
11. Any other practical based on the theory syllabus.

Suggested Books and References:

1. **Cell Biology: Laboratory Manual:** Ledbetter,M.L. (1993),. 2nd Edition, RonJon Publishing. Inc.
2. **Cell and Molecular Biology Lab. Manual:** Thompson, D.A. (2011), Createspace Independent Publishing Platform.
3. **Cell Biology Practical Manual:** Toteja,R., Gupta, R., Makhija, S. (2018), Prestige Publishers.

Course Learning Outcomes:

By the end of the Course, Students will be able to:

1. Develop working skills in cell biology that will be helpful further in research and innovations.
2. Better understanding the various cell forms and cell organelles in living systems.
3. Learn the structure and function of biomembranes in living systems.
4. Gain insight into various plastid distributions in plant cells.
5. Acquire knowledge about the histochemical localization of protein, carbohydrate, fats, starch and lignin.

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6. Learn the cell division processes of Mitosis and Meiosis.

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Syllabus

CCT-52T-ESC-126- Semiconductor Electronics Devices and Applications

II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52T-ESC-104	Semiconductor Electronics Devices and Applications				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	ESC	02	-	02	No	30 Lectures, including program development and formative assessments	
Prerequisites		XII Pass					
Objectives of the Course:		The course aims to provide students with foundational knowledge in electronics, focusing on circuit analysis, semiconductor devices, amplifiers, and oscillators. Students will understand the principles and applications of electronic components and circuits, preparing them for more advanced studies and practical work in electronics.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-52T-BSC-108–Cell Biology	1 Hrs-CA 3 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks
Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

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PART-B: 32 Marks

Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-52T-ESC-104-Semiconductor Electronics Devices and Applications

UNIT-I

Electric Network and PN junction

Electric Networks: Introduction to DC and AC circuit analysis using Kirchhoff's Laws. Understanding loop and nodal equations.

P-N Junction Diode: Understanding charge carriers, drift, and diffusion processes. The P-N junction diode equation, and the effects of capacitance.

(7 Lectures)

Unit-II

Semiconductor Devices and Rectifiers

Rectifiers and Filters: Half-wave, full-wave, and bridge rectifiers. Ripple factor, efficiency, and voltage regulation. Introduction to filters: Series inductor, shunt capacitor, L-section, and π-section filters.

Zener Diode Voltage Regulation: Working principles of Zener diodes in voltage regulation. Introduction to voltage multipliers.

(8 Lectures)

Unit-III

Transistor Fundamentals and Biasing

Transistor Basics: Operation and characteristic curves of Bipolar Junction Transistors (BJTs). Understanding the concept of the load line and operating point.

Transistor Configurations: Common Base (CB), Common Emitter (CE), and Common Collector (CC) configurations.

(8 Lectures)

Unit-IV

Amplifiers and Oscillators

Amplifiers: Introduction to transistor amplifiers using hybrid parameters. Concepts of positive and negative feedback in amplifiers.

Oscillators: Principles of oscillation, feedback concept, and Barkhausen criterion for sustained oscillations. Study of different types of oscillators: RC and LC Oscillators.

(8 Lectures)

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Suggested Books and References:

1. Basic Electronics and Linear Circuits by N.N. Bhargava, D.C. Kulshreshtha, S.C. Gupta.
2. Solid State Electronic Devices by Ben G. Streetman and Sanjay Kumar Banerjee.
2. "Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky
3. "Microelectronic Circuits" by Adel S. Sedra and Kenneth C. Smith
4. "Solid State Electronic Devices" by Ben G. Streetman and Sanjay Kumar Banerjee
5. "The Art of Electronics" by Paul Horowitz and Winfield Hill
6. "Electronic Principles" by Albert Malvino and David Bates
7. "Electronic Devices and Circuits" by David A. Bell
8. "Basic Electronics for Scientists and Engineers" by Dennis L. Eggleston
9. "Foundations of Analog and Digital Electronic Circuits" by Anant Agarwal and Jeffrey H. Lang
10. "Electronic Instrumentation and Measurements" by David A. Bell

Course Learning Outcomes:

Upon completion of the course, students will be able to verify and apply Kirchhoff's laws in practical circuits, analyze and interpret the characteristics of various semiconductor devices, and measure and evaluate properties like band gap and temperature dependence in semiconductors. They will also gain the ability to design and assess rectifier circuits, voltage regulators, and oscillators, while understanding the role of feedback in amplifiers to enhance circuit performance. These skills will equip students to tackle real-world electronic design challenges effectively.

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Syllabus

CCT-52P-ESC-122-Semiconductor Electronics Lab

II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52P-ESC-122	Semiconductor Electronics Lab				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	ESC	-	02	02	No	60 Hours practical's	
Prerequisites		XII Pass					
Objectives of the Course:		This course aims to provide practical understanding and hands-on experience in fundamental electronics concepts, including circuit analysis, semiconductor device characteristics, and oscillator design. Students will develop the ability to design, build, and analyze electronic circuits, enhancing their problem-solving skills and preparing them for advanced studies in electronics.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-52P-ESC-122– Semiconductor Electronics Lab	1 Hrs-CA 4 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The Practical examination Scheme for the **Semiconductor Electronics Lab** should be as follows –

- Two Practical Exercises of 15 Marks each– 30 Marks
- Viva-Voce – 5 Marks

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- Record – 5 Marks

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Detailed Syllabus

CCT-52P-ESC-122-Semiconductor Electronics Lab

1. Verify Kirchhoff's laws using breadboard circuits with resistors and voltage sources.
2. Study the characteristics of a given transistor (PNP/NPN) in common emitter, common base, and common collector configurations.
3. Determine the band gap of a semiconductor using a junction diode.
4. Study the temperature dependence of resistance in a semiconductor using the four-probe method.
5. Study the characteristics of a junction diode and a Zener diode.
6. Study the characteristics of a field effect transistor (FET) and design an amplifier with finite gain.
7. Study a power supply using two diodes or a bridge rectifier with various filter circuits.
8. Study a half-wave rectifier using a single diode and apply L and π section filters.
9. Design a Zener-regulated power supply and study the regulation with various loads.
10. Study the frequency response of a transistor amplifier and obtain the input and output impedance.
11. Design and study an R-C phase shift oscillator and measure the output impedance (frequency response with change of R and C components).
12. Study a voltage multiplier circuit to generate high voltage D.C. from A.C.
13. Design a Hartley oscillator and study its frequency stability and waveform.
14. Design a Colpitts oscillator and evaluate its performance.
15. Investigate the effect of negative feedback on amplifier performance.

Suggested Books and References:

1. "Electronic Devices and Circuit Theory" by Robert L. Boylestad and Louis Nashelsky
2. "Microelectronic Circuits" by Adel S. Sedra and Kenneth C. Smith
3. "Solid State Electronic Devices" by Ben G. Streetman and Sanjay Kumar Banerjee
4. "The Art of Electronics" by Paul Horowitz and Winfield Hill
5. "Electronic Principles" by Albert Malvino and David Bates
6. "Electronic Devices and Circuits" by David A. Bell
7. "Basic Electronics for Scientists and Engineers" by Dennis L. Eggleston
8. "Foundations of Analog and Digital Electronic Circuits" by Anant Agarwal and Jeffrey H. Lang
9. "Electronic Instrumentation and Measurements" by David A. Bell

Course Learning Outcomes:

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Upon completion of the course, students will be able to verify and apply Kirchhoff's laws in practical circuits, analyze and interpret the characteristics of various semiconductor devices, and measure and evaluate properties like band gap and temperature dependence in semiconductors. They will also gain the ability to design and assess rectifier circuits, voltage regulators, and oscillators while understanding the role of feedback in amplifiers to enhance circuit performance. These skills will equip students to tackle real-world electronic design challenges effectively.

Syllabus

CCT-52T-ESC-105-Object Oriented Programming Methodology

II-Semester

Semester	Code of the Course	Title of the Course/Paper			NHEQF Level	Credits
II	CCT-52T-ESC-105	Object Oriented Programming Methodology			5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method
		Theory	Practical	Total		
Introductory	ESC	02	-	02	No	30 Lectures, including program development
Prerequisites		A course on Programming in C				
Objectives of the Course:		1. Introduces Object Oriented Programming concepts using the C++ language. 2. Introduces the principles of data abstraction, inheritance and polymorphism; 3. Introduces the principles of virtual functions and polymorphism 4. Introduces handling formatted I/O and unformatted I/O 5. Introduces exception handling				

Examination Scheme for EoSE-

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Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	**CCT-52T-ESC-105– Object-Oriented Programming Methodology**	**1 Hrs-CA** **3 Hrs-EoSE**	**10 Marks-CA** **40 Marks-EoSE**	**4 Marks-CA** **16 Marks-EoSE**

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks

Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.

PART-B: 32 Marks

Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

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Detailed Syllabus

CCT-52T-ESC-105-Object Oriented Programming Methodology

UNIT-I

Principles of Object-Oriented Programming (OOP), A Look at Procedure Oriented Programming, OOP Paradigm, Basic Concepts of OOP, Benefits of OPP, Application of OOP.

Introduction to C++: What is C++, A simple C++ Program, Structure of C++ Program. Tokens, Expression and controls Structures, Keywords, Identifiers and Constants, C++ data types, Variables: Declaration, Dynamic initialization of variables, Reference variables.

(6 Hrs Lecture)

UNIT-II

Operators in C++: Scope resolution operators, Member dereferencing Operators, Memory Management Operators, Manipulators, Type cast operators. Functions: The main () function, Function Prototyping, Call by reference, Return by reference, Inline function, and Function Overloading.

Classes and Objects: Introduction, A C++ Program with Class, Defining member Functions, Nesting of Member functions, Private member functions, Memory Allocation for Objects, Static Data members, Static Member Functions, Arrays within a Class, Arrays of Objects, Objects as Function Arguments, Friend Functions, Returning Objects.

Operator Overloading: Defining Operator Overloading, Overloading Unary Operators, and Overloading Binary Operators, Type Conversions.

(8 Hrs Lecture)

UNIT-III

Pointers: Declaration and initializing, Manipulation of pointers, pointers Expression and Pointer Arithmetic, Pointer with Arrays, Arrays of Pointers, Pointers to objects, this pointers, Arrays of Pointers to Objects.

Constructors and Destructors: Constructors, Parameterized Constructors, Multiple Constructors in a class, Copy constructors, and Destructors.

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Inheritance and Polymorphisms: Introduction, Defining Derived Classes, Single inheritance, Multiple inheritance, Hierarchical inheritance, Multilevel inheritance, Hybrid inheritance, Virtual Base Classes, static and dynamic binding, Constructor in Derived Classes, Pointers to Derived Classes, Virtual Functions, Pure Virtual Functions.

(8 Hrs Lecture)

UNIT-IV

Templates and Exception Handling: Function templates, Function templates with multiple arguments, Class templates, Exceptional Handling (Try, throw and catch), Use of exceptional handling.

I/O Operations and Files: C++ Stream Classes, Unformatted I/O Operations, Formatted I/O operations, Classes for File Streams, Opening and Closing a File: open() and close() functions, Manipulators of File Pointers: seekg(), seekp(), tellg(), tellp() functions, Sequential Input and output Operations: put (), get(), write(), read() functions, Error handling File Operations: eof(), fail(), bad(), good() .

(8 Hrs Lecture)

Suggested Books and References:

1. Robert Lafore, Object Oriented Programming in C++, Fourth Edition, SAMS publications.
2. Herbert Schildt, C++ The Complete Reference, Fourth Edition, Tata McGraw Hill Publication.
3. E. Balagurusamy - Object Oriented Programming with C++ - TMH
4. Deitel and Deitel, C++ How to Program, Third Edition, Pearson Publication.
5. Joyce Farrell, Object-oriented programming using C++, Fourth Edition, Cengage Learning.

Course Learning Outcomes:

1. Able to develop programs with reusability.
2. Develop programs for file handling.
3. Handle exceptions in programming.
4. Develop applications for a range of problems using object-oriented programming techniques.

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Syllabus

CCT-52P-ESC-123-C++ Computer Programming Lab

II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52P-ESC-123	C++ Computer Programming Lab				5	02
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	ESC	-	02	02	No	60 Hours Lab	
Prerequisites		A course on "Programming in C".					
Objectives of the Course:		1. to know about Object-oriented programming. 2. To Use Abstract Data Types in the programs. 3. Application of non-recursive functions. 4. OOP principles like Encapsulation Inheritance Polymorphism were frequently used.					

Examination Scheme for EoSE-

Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	CCT-52P-ESC-123– C++ Computer Programming Lab	1 Hrs-CA 4 Hrs-EoSE	10 Marks-CA 40 Marks-EoSE	4 Marks-CA 16 Marks-EoSE

The Practical examination Scheme for the **C++ Computer Programming Lab** should be as follows –

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- Two Practical Exercises of 15 Marks each– 30 Marks
- Viva-Voce – 5 Marks
- Record – 5 Marks

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Detailed Syllabus

CCT-52P-ESC-123-C++ Computer Programming Lab

Programming Assignments:

1. Write a C++ program to find the sum of all the natural numbers from 1 to n.
2. Write a C++ program to swap 2 values by writing a function that uses call-by-value and call-by-reference techniques.
3. Write a C++ program to display the Names, Roll No., and grades of 3 students who have appeared in the examination. Declare the class of name, roll no., and grade. Create an array of class objects. Read and display the contents of the array.
4. Write a C++ program to read the data of N employees and compute the net salary of each employee (HINT: DA=52% of basic and IT=30% of gross salary).
5. Write a C++ to illustrate the concepts of console I/O operations.
6. Write a C++ program to implement the concept of function overloading and operator overloading using the friend function.
7. Write a C++ program to demonstrate the concept of inheritance in C++.
8. Write a C++ program to use the pointer for both base and derived classes and call the member function (Use virtual keyword).
9. Write a C++ program to demonstrate the usage of try, catch and throw to handle the exception.
10. Write a C++ program to create a text file, check file is created or not, if created it will write some text into the file and then read the text from the file.

Suggested Books and References:

1. Data Structures Using C And C++ -Yedidyah Langsam & M.Tenenbaum
2. Object-Oriented Programming In C++ -Nabajyoti Barkakati
3. Object-Oriented Programming In C++ -E Balagurusamy

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Course Learning Outcomes:

Upon successful completion of this lab the student will be able to Develop Applications For a range of Using Object-Oriented Programming Techniques.

Syllabus

CCT-52F-MC-102-Environmental Studies

II-Semester

Semester	Code of the Course	Title of the Course/Paper				NHEQF Level	Credits
II	CCT-52F-MC-102	Environmental Studies					00
Level of Course	Type of the Course	Credit Distribution			Offered to NC Student	Course Delivery Method	
		Theory	Practical	Total			
Introductory	MC	00	00	00	No	30 Lectures	
Prerequisites		Knowledge of high school natural and basic science.					
Objectives of the Course:		• To make students aware of the importance of the physical environment and its various components. • To make students realize their role in the protection and maintenance of a healthy environment for sustainable development. • To understand the significance and issues related to natural resources, ecosystems, and biodiversity. • To encourage them to explore ways of managing/ conserving natural resources. • To develop an understanding of causes and sources of environmental pollution and their impact on quality of life. • To educate young minds about environmental movements and laws. • To encourage to adoption of sustainability as a practice in life, society, and industry.					

Examination Scheme for EoSE-

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Type	Paper code and Nomenclature	Duration of Examination	Maximum Marks (CA + EoSE)	Minimum Marks (CA + EoSE)
Theory	**CCT-52T-ESC-105– Object-Oriented Programming Methodology**	**1 Hrs-CA 3 Hrs-EoSE**	**10 Marks-CA 40 Marks-EoSE**	**4 Marks-CA 16 Marks-EoSE**

The question paper will consist of **two** parts **A** & **B**.

PART-A: 8 Marks
Part A will be compulsory having 8 very short answer-type questions (with a limit of 20 words) of two marks each.
PART-B: 32 Marks
Part B of the question paper shall be divided into four units comprising question numbers 2-5. There will be one question from each unit with internal choice. Each question will carry 8 marks.

Detailed Syllabus

CCT-52F-MC-102-Environmental Studies

Unit-I

Human and the Environment

Definition, scope and multidisciplinary nature of Environmental Studies. Need for Environmental awareness and environmental education in the present-day context.

Population growth, variation among nations, Population explosion: Family Welfare Programme, Impacts of rising population on human health and environment.

Human Rights, Environmental ethics, World food problems, Role of Information Technology in Environment and human health.

[6 Hours Lecture]

Unit-II

Natural Resources, Management and Sustainability

Classification of resources: renewable and non-renewable resources.

Forest resources: Use and over-exploitation, causes and impacts of deforestation.

Water resources: Use and over-utilization of surface and groundwater, floods, drought, and conflicts over water.

Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, related case studies.

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Energy resources: Growing energy need, renewable and non-renewable energy sources, use of alternate energy sources. Related case studies.

Land resources, Land degradation, fertilizer-pesticide problems, water logging, salinity, soil erosion and desertification. changes caused by agriculture and overgrazing, effects of modern agriculture.

Sustainability and resource conservation: Sustainable development, Sustainable Development Goals, Equitable use of resources for sustainable lifestyles, resource conservation, rainwater harvesting, watershed management, wasteland reclamation.

[8 Hours Lecture]

Unit-III

Ecosystem and Biodiversity

Concept, Structure and functions of the ecosystem: Producers, consumers and decomposers, Energy flow in the ecosystem, Food chains, food webs and ecological pyramids.

Ecosystems and ecosystem services: Major ecosystem types in India and their basic characteristics- forests, wetlands, grasslands, agriculture, coastal and marine; Ecosystem services- classification and their significance.

Concept, definition and types of biological diversity (genetic, species and ecosystem diversity). Value of biodiversity: consumptive use, productive use, social, ethical, aesthetic, option values.

Threats to biodiversity, Biodiversity at global, national and local level, Hot-spots of biodiversity. India as a mega-diversity nation, Biogeographical classification of India, Endangered, Threatened and endemic species of India.

Conservation of biodiversity: *In-situ* and *Ex-situ* conservation of biodiversity, Red Data Book

[8 Hours Lecture]

Unit-IV

Environmental Issues

Definition, Causes, effects and control measures of: Air, Water, Soil, Marine, Noise, Thermal, Nuclear. Greenhouse gases and their impacts, Climate change, Global warming, Acid rain, Ozone layer depletion, Nuclear accidents and holocaust.

Solid waste management: Generation and management of urban, industrial, biomedical and e-wastes. Waste Management- Concept of 3R (Reduce, Recycle and Reuse).

Environmental Protection Act, Water (Prevention and Control of Pollution) Act, Air (Prevention and Control of Pollution) Act, Wild life protection Act, Forest Conservation Act, Biological Diversity Act.

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Social issues: Resettlement and rehabilitation of people: its problems and concerns. Environmental movements: Chipko, Appiko movement, Silent valley, Big dam movements. Environmental audit and Environmental Impact Assessment.

International agreements: Earth Summits, Convention on Biological Diversity (CBD), Montreal Protocol, Kyoto protocol.

[8 Hours Lecture]

Suggested Books and References:

1. Ahluwalia, V. K. (2016) Environmental Studies: Basic concepts. Energy and Resources Institute
2. Asthana, D. K. (2006). Text Book of Environmental Studies. S. Chand Publishing.
3. Basu, M. and Xavier, S. (2016). Fundamentals of Environmental Studies, Cambridge University Press, India
4. Basu, R. N. (Ed.) (2000). Environment. University of Calcutta, Kolkata.
5. Bharucha, E. (2013). Textbook of Environmental Studies for Undergraduate Courses. Universities Press.
6. Fisher, Michael H. (2018). An Environmental History of India- From Earliest Times to the Twenty-First Century, Cambridge University Press.
7. De, A.K. (2006). Environmental Chemistry, 6th Edition, New Age International, New Delhi.
8. Headrick, Daniel R. (2020) Humans versus Nature- A Global Environmental History, Oxford University Press.
9. Jha L. and Shailendra, Environmental Studies, CBH publications, Jaipur
10. Manahan, S.E. (2022). Environmental Chemistry (11th ed.). CRC Press.
11. Rajagopalan, R. (2011). Environmental Studies from Crisis to Cure. Oxford University Press
12. Sharma, P. D. (2005). Ecology and Environment. Rastogi Publications.
13. Singh, J.S., Singh, S.P. and Gupta, S.R. (2006). Ecology, Environment and Resource Conservation. Anamaya Publications

Course Learning Outcomes:

After completion of this course, students will be able to:

- Gain in-depth knowledge of natural processes and resources that sustain life and govern the economy.
- Develop critical thinking to shape strategies (scientific, social, economic, administrative, and legal) for environmental protection, conservation of biodiversity, protection of natural resources and sustainable development.

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- Understand and predict the consequences of human actions on the environment and quality of human life.
- Acquisition of values and attitudes towards understanding complex environmental economic-social challenges.
- Actively participate in solving current environmental problems and preventing future ones.

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