

Dr. N.G.P. ARTS AND SCIENCE COLLEGE

(An Autonomous Institution, Affiliated to Bharathiar University, Coimbatore) Approved by Government of Tamil Nadu and Accredited by NAAC with 'A++' Grade (3rd Cycle-3.64 CGPA) Dr. N.G.P. - Kalapatti Road, Coimbatore-641048, Tamil Nadu, India Web: www.drngpasc.ac.in |Email: info@drngpasc.ac.in | Phone: +91-422-2369100

2024-25 for Under Graduate Programme (Outcome Based Education model with Choice Based Credit System)

B.Sc. Biotechnology Degree

(For the students admitted during the academic year 2024-25 and onwards)

Programme: Biotechnology

Eligibility:

A candidate who has passed in Higher Secondary Examination with any Academic Stream or Vocational Stream as one of the subjects under Higher Secondary Board of Examination and as per the norms set by the Government of Tamil Nadu or an Examination accepted as equivalent thereto by the Academic Council, subject to such conditions as may be prescribed thereto are permitted to appear and qualify for the **Bachelor of Biotechnology Degree Examination** of this College after a programme of study of three academic years.

Programme Educational Objectives:

The Curriculum is designed to attain the following learning goals which students shall accomplish by the time of their graduation:

1. To demonstrate a substantial understanding of concepts in key areas of Biotechnology and its applications.

2. To supplement the academic input of students by way of seminars, conferences, guest lectures and industrial visits.

3. To describe the common methods and applications of biotechnology with regards to microorganisms, plants, animals and Pharma industries.



PROGRAMME OUTCOMES:

On the successful completion of the program, the following are the expected outcomes.

PO Number	PO Statement
PO1	Students will be able to identify, analyze and understand problems related to biotechnology and finding valid conclusions with basic knowledge in biotechnology.
PO2	Graduates will be able to justify societal, health, safety and legal issues and understand his responsibilities in biotechnological practices.
PO3	Provide education that leads to comprehensive understanding of the principles and practices of biotechnology that will help to undertake any responsibility as an individual and as a team in a multidisciplinary environment.
PO4	Graduates will be able to demonstrate knowledge of project management when dealing with Biotechnology problems.
PO5	Students will possess hands-on technical skills necessary for supporting biotechnology research activity and empower students with the ability to think and solve problems in the field of biotechnology.



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Credit Distribution Pattern for UG Programme:

Part	Subjects	No. of Papers	Credit	Semester No.
Ι	Tamil / Hindi / French/Malayalam	4	4 x 3 = 12	I to IV
II	English	4	4 x 3 = 12	I to IV
	Core (Credits 2,3,4,5)	16-19	70	I to VI
III	Inter Departmental Course (IDC)	4	16	I to IV
	Discipline Specific Elective (DSE)	3	3 x 4 =12	V & VI
	Skill Enhancement Course (SEC)	4	8	III ,IV,V& VI
	Industrial Training	1	2	V
	Environmental Studies(AECC)	1	2	Ι
IV	Basic Tamil/ Advanced Tamil/ Human Rights & Womens' Rights (AECC)	1	2	II
	Generic Elective (GE) (AEEC)	1	2	V
	Innovation &IPR/ Innovation, IPR & Entrepreneurship (AECC)	1	2	VI
v	NSS/NCC/YRC/RRC/Yoga/ Sports/Clubs	-	2	I -II
	TOTAL		142	



UG CURRICULUM

BIOTECHNOLOGY AY 2024- 2025

Course Code	Course Category	Course Name	L	Т	P	Instru Hou	uction urs	Exam (h)	N	arks	Credits	
						Week	Total		CIA	ESE	Total	
First Semester				I								
Part - I						E SE						
24TLU1TA/ 24TLU1HA/ 24TLU1MA/ 24TLU1FA	Language-I	Tamil-I /Hindi- I/ Malayalam-I/ French-I	4	1	-	5	60	3	25	75	100	3
Part - II						-		<u>I</u>			1. T. T.	
24ELU1EA	Language-II	English–I	4	_	1	5	60	3	25	75	100	3
Part - III												1
24BTU1CA	Core -I	Cell Biology	4	1	_	5	60	3	25	75	100	4
24BTU1CB	Core -II	Microbiology	4	1	-	5	60	3	25	75	100	3
24BTU1CP	Core Practical- I	Cell Biology and Microbiology			4	4	48	6	40	60	100	2
24CEU1IB	IDC-I	Chemistry	4	-	-	4	48	3	25	75	100	4
Part-IV												
24MBU1AA	AECC -I	Environmental studies	2	-	-	2	24	-	50	-	50	2
Part -V												
24BTU1XA	Extension Activity	NSS/NCC/YRC/RRC /Yoga/Sports	-	-	-	-	-	-	50	-	50	1
	Total		22	3	5	30	360				700	22



Course Code	Course Category	Course Name	L	Т	Р	Instru Hou	ction 1rs	Exam (h)	M	rks	Credits	
	Cuttgory					Week To		Total				
									CIA	ESE	Total	
Second Semest	er											
Part - I								100				
24TLU2TA/ 24TLU2HA/ 24TLU2MA/ 24TLU2FA	Language-I	Tami-II/Hindi- II/Malayalam- II/French-II	4	1	-	5	60	3	25	75	100	3
Part - II												
4ELU2EA	Language-II	English–II	4	-	1	5	60	3	25	75	100	3
Part - III												
4BTU2CA	Core -III	Genetics	4	1	-	5	60	3	25	75	100	4
4BTU2CB	Core -IV	Biochemistry	4	1	-	5	60	3	25	75	100	3
4BTU2CP	Core Practical- II	Genetics and Biochemistry	-	-	4	4	48	6	40	60	100	2
4PYU2IA	IDC-II	Biophysics	4	-	-	4	48	3	25	75	100	4
Part-IV												
4TLU2AA/ 4TLU2AB/ 4CRU2AA	AECC -II	Basic Tamil/ Advance Tamil /Human Rights and Women's Rights	2	-	-	2	24	-	50	-	50	2

		Rights		12							14.45	
Part -V												
24BTU2XA	Extension Activity	NSS/NCC/YRC/ RRC/Yoga/Sports	-	-	-	-	-	-	50	-	50	1
	Total		22	3	5	30	360				700	22



Course Code

24TLU2TA/ 24TLU2HA/ 24TLU2MA/ 24TLU2FA

24ELU2EA

Part - III 24BTU2CA

24BTU2CB

24BTU2CP

24PYU2IA

Part-IV 24TLU2AA/ 24TLU2AB/ 24CRU2AA

Course Code	Course	Course Name	L	т	Р	Instru Hou	ction ars	Exam (h)	Max Marks			Credits
	Category					Week	Total					
									CIA	ESE	Total	
Third Semester			Ļ	l	LJ		l					
Part - I			- 1 - 7 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1									
24TLU3TA/ 24TLU3HA/ 24TLU3MA/ 24TLU3FA	Language-I	Tamil-III/ Hindi-III/ Malayalam-III/ French-III	3	1	-	4	48	3	25	75	100	3
Part - II	2					J	<u>.</u>					
24ELU3EA	Language-II	English–III	3	1	-	4	48	3	25	75	100	3
Part - III			l	J					J			
24BTU3CA	Core -V	Molecular Biology	4	-	-	4	48	3	25	75	100	4
24BTU3CB	Core -VI	Biodiversity	4	-	-	4	48	3	25	75	100	4
24BTU3CP	Core Practical-III	Molecular Biology and Biodiversity	-	-	4	4	48	6	40	60	100	2
24MTU3IE	IDC-III	Basic Mathematics	4	-	-	4	48	3	25	75	100	4
24BTU3SM	SEC Practical-I	Biotechniques	2	-	4	6	72	6	40	60	100	2
	Total		20	2	8	30	360				700	22



Course Code	Course	Course Name	L	т	Р	Instru Hou	ction Irs	Exam (h)	M	ax Ma	rks	Credits
Course Coue	Category				F	Week	Total					
				ξ			inen e e		CIA	ESE	Total	
Fourth Semeste	 ? r				LL							
Part - I												
24TLU4TA/ 24TLU4HA/ 24TLU4MA/ 24TLU4MA/ 24TLU4FA	Language-I	Tamil-IV/ Hindi-IV/ Malayalam - IV/ French-IV	3	1	-	4	48	3	25	75	100	3
Part - II				L	L	ļ	Ļ	L				
24ELU4EA	Language-II	English–IV	3	1	-	- 4	48	3	25	75	100	3
Part - III			L	J	Ļ	4.						
24BTU4CA	Core -VII	Immunology	5	-	-	5	60	3	25	75	100	5
24BTU4CB	Core -VIII	Bioinformatics	4	-	-	4	48	3	25	75	100	4
24BTU4CP	Core Practical- IV	Immunology and Bioinformatics	-	- `	4	4	48	6	40	60	100	2
24CSU4IB	IDC-IV	Python for Biologists	4	-	-	4	48	3	25	75	100	4
24BTU4SM	SEC Practical-II	Recombinant DNA Technology	2	-	3	5	60	6	40	60	100	2
	Total	l	21	2	7	-30	360				700	23



Course Code	Course Category	Course Name	L	т	Р	Instruction Hours		Instruction Hours		Exam (h)	М	ax Ma	rks	Credits
						Week	Total		СІА	ESE	Total			
Fifth Semester		1			J	1	<u>.</u>							
Part - III								£						
24BTU5CA	Core -IX	Plant and Animal Biotechnology	4	1	-	5	60	3	25	75	100	5		
24BTU5CB	Core -X	Environmental Biotechnology	4	1		5	60	3	25	75	100	5		
24BTU5CC	Core -XI	Entrepreneurial Biotechnology	4	1	-	5	60	3	25	75	100	5		
24BTU5CP	Core Practical-V	Plant, Animal and Environmental Biotechnology	-	-	6	6	72	6	40	60	100	3		
24BTU5SA	SEC-III	Bioprocess Technology	3	-	-	3	36	3	25	75	100	2		
24BTU5DA		Clinical Trials												
24BTU5DB	DSE-I	Bioethics and Biosafety	4	- ,	-	4	48	3	25	75	100	4		
24BTU5DC		Molecular Signaling	1						a Same					
24BTU5TA	IT	IndustrialTraining	-	-	-	-	-	3	40	60	100	2		
Part-IV											•	-		
	GE		2	-	-	2	24	3	50	-	50	2		
	Total		21	3	6	30	360				750	28		



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Course Code	Course Category	Course Name	L	т	Р	Instru Hou	ction 1rs	Exam (h)	N	rks	Credits	
						Week	Total]		A)		
									CIA	ESE	Total	
Sixth Semester	r			1	ι			4	L		L	.
Part - III										-		
24BTU6CA	Core-XII	Genomics and Proteomics	4	1	-	5	60	3	25	75	100	5
24BTU6CB	Core- XIII	Bionanotechnology	4	1	-	5	60	3	25	75	100	5
24BTU6CP	Core Practical - VI	Genomics, Proteomics and Bionanotechnology	-	-	6	6	72	6	40	60	100	3
24BTU6SA	SEC-IV	Stem Cell Technology	4	-	-	4	48	3	25	75	100	2
24BTU6DA		Drug Design and Delivery										
24BTU6DB		Biomaterials	4	-		4	48	3	25	75	100	4
24BTU6DC	DSE-II	Synthetic Biology										
24BTU6DD		Biomarker Technology										· .
24BTU6DE	DSE-III	Molecular Diagnostics	4	-	-	4	48	3	25	75	100	4
24BTU6DF		Food Technology					⁶ 1997		100			
Part-IV												-
24BIU6AA	AECC-III	Innovation and IPR	2	-	-	2	24	3	50	-	50	2
	Total		22	2	6	30	360				650	25
		Grai	nd Tota	ıl		0.					4200	142

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BoS Chairman/HoD 614124 Department of Biotechnology Dr. N. G. P. Arts and Science College Coimbatore – 641 048

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BOS- 17+5		AC-1-1+-2	GB -							
6/04/24		17/04/24								





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B.Sc. Biotechnology (Students admitted during the AY 2024-25)

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DISCIPLINE SPECIFIC ELECTIVE

Students shall select the desired course of their choice in the listed elective course during Semesters V & VI

Semester V (Elective I)

List of Elective Courses

S. No.	Course Code	Name of the Course	
1	24BTU5DA	Clinical Trials	April 10
2	24BTU5DB	Bioethics and Biosafety	
3	24BTU5DC	Molecular Signaling	

Semester VI (Elective II)

List of Elective Courses

S. No.	Course Code	Name of the Course
1 · ·	24BTU6DA	Drug Design and Delivery
2	24BTU6DB	Biomaterials
3	24BTU6DC	Synthetic Biology

Semester VI (Elective III)

List of Elective Courses

S. No.	Course Code	Name of the Course
1	24BTU6DD	Biomarker Technology
2	24BTU6DE	Molecular Diagnostics
3	24BTU6DF	Food Technology



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GENERIC ELECTIVE COURSES (GE)

The following are the courses offered under Generic Elective Course

Semester V (GE-I)

S. No.	Course Code	Course Name	
1	24BTU5GA	Mushroom Technology	

EXTRACREDITCOURSES

The following are the courses offered under self study to earn extra credits: Semester III

S. No.	Course Code	Course Name
1	24BTUSSA	Biofertilizer Technology
2	24BTUSSB	Environmental Management



			Semester – I				
			TAMIL - I				
Semester	Course Code	Course Name	Category	L	Т	Р	Credits
I	24TLU1TA	TAMIL - I	LANGUAGE- I	48	12	-	3

Preamble	மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடுநாகரீகம், பகுத்தறிவு
	ஆகியவற்றை அறியச் செய்தல்
	கலை மற்றும் மரபுகளை அறியச் செய்தல்
	மாணவர்களின் படைப்பாக்கத்திறன்களை ஊக்குவித்தல்
Prerequisite	தமிழ் மொழி எழுதி படிக்கும் திறன்

Course Outcomes (Cos)		
CO.No.	Course Outcomes (COs) Statement	Bloom's Taxanomy Knowledge Level
CO1	வாழ்க்கைத்திறன்கள் (Life Skills)-மாணவர்களின் செயலாக்கத்திறனை ஊக்குவித்தல்	K2
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K3
CO3	பாடஇணைச்செயல்பாடுகள் (Co-curricular activities)	K3
CO4	சூழலியல் ஆக்கம் (Ecology)	K4
CO5	மொழி அறிவு (Tamil knowledge)	K4

Mapping with	Program Out	tcomes:			
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1		1	~		1
CO2	~			~	
CO3		1			✓
CO4			~		
CO5	\checkmark			~	1



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Unit	Content	Hrs	Resources
1	மறுமலர்ச்சிக் கவிதைகள்	ale al	
	1. இலக்கிய வரலாறு -மறுமலர்ச்சிக் கவிஞர்களின்தமிழ்ப்பணிகள்	n gjaper	「常常はたいです」「
	2. பாரததேசம்- பாரதியார்		
	3. படி - பாரதிதாசன்	NUT THE	தமிழ்மொழிப்பாடம்
	4. தமிழரின் பெருமை- நாமக்கல்கவிஞர்	13	முதற்பருவம் 2024-2025
	5. தமிழ்க் கொலை புரியாதீர்- புலவர் குழந்தை		https://www.youtube.com/
	6. திரைத்தமிழ்		watch?v=Up55uhkk9zI
	அ) 'விஞ்ஞானத்த வளர்க்கப் போறண்டி' எனத்தொடங்கும் பாடல் - உடுமலை நாராயண கவி		
		·	
	பட்டுக்கோட்டை கல்யாண சுந்தரனார்		
	இ) 'சமரசம் உலாவும் இடமே' எனத்தொடங்கும் பாடல் - மருதகாசி		
	ு. ஈ) 'உன்னை அறிந்தால்' எனத்தொடங்கும் பாடல்-கண்ணதாசன்		
2	புதுக்கவிதைகள்		
	1. இலக்கிய வரலாறு- புதுக்கவிதையின் தோற்றமும் வளர்ச்சியும்		
1	2. கடமையைச் செய்- மீரா		தமிழ்மொழிப்பாடம்
	3. ஓடு ஓடு சங்கிலி – சிற்பி பாலசுப்பிரமணியம்	13	முதற்பருவம்
	4. ஒப்பிலாத சமுதாயம் - அப்துல் ரகுமான்		2024-2025
	5. மரங்கள் - மு.மேத்தா		watch?v=dX9ZaNJMaco
	6. கரிக்கிறது தாய்ப்பால்- ஆரூர் தமிழ்நாடன்	and it?	
	7. ஐந்தாம் வகுப்பு 'அ' பிரிவு - நா. முத்துக்குமார்		
	8. ஹைகூ கவிதைகள் - 10 கவிதைகள்		
3	பெண்ணியம்		தமிழ்மொழிப்பாடம்
	1. தொலைந்து போனேன் - தாமரை	10	முதற்பருவம் 2024 ₋ 2025
	2. நீரில் அலையும் முகம் - அ. வெண்ணிலா		https://www.youtube.com/
	ு. தற்காததல் - பொன்மணி வைரமுத்து 4ிர்ிர்ப்பு்பி		watch?v=DLabokqWEdg
	4. ஏனந்த வத்தியாசங்கள் ? - மல்லகா 5. புதையான் காட்ட்கை காட்சி கப்புணியன்		
4	5. புதையுண்ட வாழககை - சுகந்து சுபரமணியன் 1 லைக்கிய வாலாறு-கிறுககையின் கோற்றமும் வளர்க்கியம்		
	2. கனகாம்பாம்- கு.ப.ராஜகோபாலன்		தமிழ்மொழிப்பாடம்
	3. கடிதம்- புதுமைப்பித்தன்	14	முதற்பருவம்
	4. பொம்மை - ஜெயகாந்தன்		2024-2025
	5. காய்ச்சமரம் - கி. ராஜநாராயணன்		https://www.youtube.com/
	6. காட்டில் ஒருமான்- அம்பை		watch (v=/ou/IIN3008
	(.வேட்கை – சூர்யகாந்கள்		



5	பயிற்சிப் பகுதி அ. இலக்கணம் 1. வல்லின ஒற்று மிகும், மிகா இடங்கள் - ஒற்றுப்பிழை நீக்கிஎழுதுதல் 2. ர,ற-ல,ழ,ள - ண,ந,னவேறுபாடு - ஒலிப்பு நெறி, சொற்பொருள் வேறுபாடு அறிதல் ஆ. படைப்பாக்கம் 1. கவிதை- எழுதுதல் (15 வரிகள் முதல் 30 வரிகள் வரை) 2.சிறுகதை - எழுதுதல் (குறைந்தது 3 பக்கங்கள்)	10	தமிழ்மொழிப்பாடம் முதற்பருவம் 2024-2025 https://www.youtube.com/ watch?v=B3wfM0QL6N8 https://www.youtube.com/ watch?v=FchTlqAtwBU https://www.youtube.com/ watch?v=gCP3gC-JQU4 https://www.youtube.com/ watch?v=p9QOHD12Yeo
	Total	60	

Text book	1.	தமிழ் மொழிப்பாடம் – 2024-2025தொகுப்பு: தமிழ்த்துறை, டாக்டர்என்.ஜி.பி.
		கலைஅறிவியல்கல்லூரி, கோயம்புத்தூர் – 641048.
Reference Books	1.	பேராசிரியர் புலவர் சோம. இளவரசு, தமிழ் இலக்கிய வரலாறு, எட்டாம் பதிப்பு– 2024, மணிவாசகர் பதிப்பகம், சென்னை– 600 108.
	2.	பேராசிரியர் முனைவர் பாக்கியமேரி, முதற் பதிப்பு – 2023, இலக்கணம், இலக்கியவரலாறு , மொழித்திறன் – பூவேந்தன் பதிப்பகம், சென்னை – 600 004.

Journal and Magazines	இலக்கியஇதழ்கள்
E-Resources and Website	https://www.tamilvu.org

Learning Method Lecture/ Tutorial / Student Seminar/GD/Assignment

Forma of the Course Shill Davidonment / Employability	
Skii Development / Employability	



			Semester – I HINDI – I				
Semester	Course Code	Course Name	Category	L	Т	Р	Credits
I	24TLU1HA	HINDI – I	LANGUAGE-I	48	12	-	3

Preamble	The writing ability and develop reading skill
and the second	The various concepts and techniques for criticizing literature
	The techniques for expansion of ideas and translation process
Prerequisite	To understand the language Hindi for communication

Course Outcomes (Cos)				
CO. No.	Course Outcomes (COs) Statement	Bloom's Taxanomy Knowledge Level		
CO1	Learn the fundamentals of novels and stories	K2		
CO2	Understand the principles of translation work	К3		
CO3	Expose the knowledge writing critical views on fiction	К3		
CO4	Build creative ability	К3		
CO5	Apply the power of creative reading	K4		

Mapping with	Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5	
CO1		~	~		1	
CO2	1			~		
CO3		1			1	
CO4			~			
CO5	~			~	1	



Unit	Content	Hrs	Resources
1	गद्य – नूतनगद्यसंग्रह (जयप्रकाश)पाठ1- रजियापाठ2- मक्रीलपाठ3-	13	
S. S	बहतापानीनिर्मला		Text Book
101424	पाठ4- राष्ट्रपितामहात्मागाँधी		
2	कहानीकुंज- डाँवी.पी. 'अमिताभ'(पाठ 1-4)	13	Text Book
3	व्याकरण : शब्दविचार (संज्ञा, सर्वनाम,विशेषण)	12	Text Book
4	अनुच्छेदलेखन	12	Text Book
5	अनुवादअभ्यास-III (केवलअंग्रेजीसेहिन्दीमें) (पाठ1 to 10)	10	Text Book
	Total	60	

Text books	1.	प्रकाशक: सुमित्रप्रकाशन 204 लीलाअपार्ट्मेंट्स, 15 हेस्टिंग्सरोड′अशोकनगरइलाहाबाद-
		211001
	2.	प्रकाशक: गोविन्दप्रकाशनसदरबाजार, मथुराउत्तरप्रदेश-281001
	3.	पुस्तक: व्याकरण प्रदिप – रामदेवप्रकाशक: हिन्दी भवन 36 टेगोर नगर इलाहाबाद-211024
	4.	पुस्तक: व्याकरण प्रदिप – रामदेवप्रकाशक: हिन्दी भवन 36 इलाहाबाद-211024
	5.	प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई -17
Reference Books		

Journal and Magazines	-	
E-Resources and		
Website		

Learning Method	Lecture/ Tutorial / Student Seminar/GD/Assignment

Focus of the Course	Skill Development / Employability
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	Section of the sector	Semes	ter – I				
		MALAY	ALAM- I				
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24TLU1MA	MALAYALAM-I	LANGUAGE- I	48	12	-	3

Preamble	The writing ability and develop reading skill			
	The various concepts and techniques for criticizing literature, to learn the techniques			
	for expansion of ideas and translation process			
	The competency in translating simple Malayalam sentences into English and vice			
	versa			
Prerequisite	To understand the language Malayalam for communication			

Course Outcomes (Cos)						
CO. No.	Course Outcomes (COs) Statement	Bloom's Taxanomy Knowledge Level				
CO1	Learn the fundamentals of novels and stories	K2				
CO2	Understand the principles of translation work	К3				
CO3	Expose the knowledge writing critical views on fiction	К3				
CO4	Apply creative ability	К3				
CO5	Build the power of creative reading	K4				

Mapping with Program Outcomes:							
Cos / POs	PO1	PO2	PO3	PO4	PO5		
CO1		~	~		· •		
CO2	~			~			
CO3		~			✓		
CO4			~				
CO5	1			~	√		



Unit	Content	Hrs	Resources
1	Novel	14	Text book
	PathummayudeAdu		
2	Novel	10	Text book
	PathummayudeAdu		
3	Short Story	14	Text book
	Nalinakanthi		
4	Short Story	10	Text book
	Nalinakanthi		
5	Practical Application	12	Text book
	Expansion of ideas, General Essay and Translation		
		(0)	
	Total	60	

Text books	1.	Vaikkam Muhammed Basheer, "PathummayudeAdu" (NOVEL), DC Books &
		Kottayam
	2.	T.Padmanabhan, "Nalinakanthi" (Short Story), DC Books & Kottayam.
Reference Books	1.	MalayalaNovel Sahithyam.
	2.	MalayalaCherukathaInnale Innu.

Journal and Magazines	
E-Resources and	
Website	

Learning Method	Lecture/ Tutorial / Student Seminar/GD/Assignment

Focus of the Course Skill Development / Employability	Focus of the Course	Skill Development / Employability
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		Se	emester – I				
FRENCH - I							
Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24TLU1FA	FRENCH - I	LANGUAGE- I	48	12	-	3

Preamble	The competence in general communication skills with oral, written and						
	comprehension & expression						
	The culture, life style and the civilization aspects of the French people as well as of						
	France						
	The students to acquire competency in translating simple French sentences into						
	English and vice versa						
Prerequisite	To understand the language French for communication						

Course Outcomes (Cos)					
CO. No.	Course Outcomes (COs) Statement	Bloom's Taxanomy Knowledge Level			
CO1	Learn the Basic verbs, numbers and accents	K2			
CO2	Apply the adjectives and the classroom environment in France	K3			
CO3	Select the Plural, Articles and the Hobbies	K3			
CO4	Measure the Cultural Activity in France	K3			
CO5	Evaluate the sentiments, life style of the French people and the usage of the conditional tense	K4			

Mapping with Program Outcomes:							
Cos / POs	PO1	PO2	PO3	PO4	PO5		
CO1		~	~		1		
CO2	1			1			
CO3		~			1		
CO4			~				
CO5	1	ningation		~	√		



Unit		Co	ntent	Hrs	Resources	
1	Objectifs de Communic ation	Tâche	Activités de réception et de production orale	14	Text book Salut I	
	 Saluer Enter en contact avec quelqu'un. Se presenter. S'excuser 	En cours de cuisine, premiers contacts avec les members d'un groupe	 Comprendre des personnes qui se saluent. Ēchanger pour entrer en contact, se présenter, saluer, s'excuser. Communiquer avec <i>tu</i> ou <i>vous</i>. Comprendre les consignes de classe Ēpeler son nom et son prénom. Computer jusqu'à 10 		Page 10	
2	 Demander de se presenter. Présenter quelqu'un 	Dans la classe de français, se presenter et remplir une fiche pour le professeur.	 Comprendre les informations essentielles dans un échange en milieu professionnel. Ēchanger pour se presenteret présenterquelqu'un 	12	Text book Enchanté I Page 20	
3	Exprimers es gouts.	Dans un café, participer à une soirée de rencontres rapides et remplir de taches d'appréciation	 Dans une soirée de recontresrapid comprendre des personnes qui échangent sur elles et sur leurs goût Comprendre une personne qui parler des goûts de quelqu'un d'autre 	14	Text book J'adore I Page 30	
4	Demander à quelqu'un de faire quelque chose. Demander poliment. Parler d'actions passes. Tu veux bien?	Organiser un programme d'activités pour accueillir une personne importante	Comprendre une personne demande un service à quelqu'un. Demanderà quelqu'un de faire quelque chose. • Imaginer et raconter au passé à partir de situations dessinées.	10	Text book Autoévalua tion du module I Page 40 – Préparation au DELF A1 page 42 Tu veux bien page 46	
5	Practical Appl Make in Own S	ication entences		10	-	
		60				





Journal and Magazines	
E-Resources and Website	

Learning Method Lecture/ Tutorial / Student Seminar/GD/Assignment

Focus of the Course Skill Development / Employability



Semester – I

ENGLISH – I

Semester	Course Code	Course Name	Category	L	Т	P	Credits
I	24ELU1EA	ENGLISH - I	LANGUAGE- II	48	-	12	3
Preamble This course has been designed for students to learn and understand • the effect of dialogue, imagery and varied genres • any spontaneous spoken discourse and respond to them with proper sentence structure • the transactional concept of English language							
Prerequisit	e Basic compre	Basic comprehension of Language Skills					
Course Out	tcomes (COs)						

CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Identify the various aspects in poetry	K2
CO2	Infer linguistic and non-linguistic features of the context for understanding and interpreting	K3
CO3	Construct sentences and convey messages effectively in real life situations	K3
CO 4	Apply different reading strategies with varying speed	К3
CO5	Prepare modules with their own ideas and present them coherently in a grammatically correct form	К3

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
C01	~	~	~		
CO2		~	1		
CO3	~		~	~	1
CO4		1		~	
CO5	1		~		~



Synabus	Sy	lla	b	us
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Unit	Content	Hours	E-Contents / Resources
	Genre Studies Mathew Arnold: Dover Beach- Author's Biography- title indications- outline- paraphrasing the poem- context of poem- form- poetic devices- enjambment- techniques- Annotations		
	Niyi Osundare: Our Earth Will Not Die- Author's Biography- title indications-outline- paraphrasing the poem- context of poem- form- poetic devices- enjambment- techniques- Annotations		
I	Charles Lamb: Christ's Hospital Five and Thirty Years Ago- Author's biography- Narrative structure- Exploration of the text- passage analysis- insight of ideas- cohesion and context- style- language techniques- Annotation	12	Text Book
	James Hanson: A Famed Life - Ten Minute Comedy for Two Women - Author's Biography- Plot Summary- Detailed summary and Analysis- Themes- Important Quotations- Characters- Description - analysis- Terms- Symbols- Critical analysis		
	Sheila Nayampalli Baruna: Alone - Author's Biography- narrative structure- passage analysis- insight of ideas- cohesion and context- style- language techniques		
II	Listening Skills Listening vs. hearing- Types of listening, Tips to enhance Listening Skills, Non-verbal and Verbal signs of active listening- Comprehensive Listening- Listening to pre- recorded audios on speeches, interviews and conversations- Listening Activities- Listening and responding to complaints (formal situation), Listening to problems and offering solutions (informal)	13	Text Book
ш	Speaking Skills Formal occasions- Introducing oneself, Introducing others, Enquiries and Seeking permission, neural speaking -Making short presentations- Informal occasions- Requests, Offering help, Congratulating, Farewell party, graduation speech- Giving instructions to do a task and to use a device, Giving and asking directions	11	Text Book
IV	Reading Skills Study Skills: Skimming and Scanning- Reading different kinds of texts- Types of reading-Developing a good reading speed, reading aloud, Referencing skill- Word	12	Text Book



	Power (Denotation and Connotation) - Reading comprehension, Data interpretation –Charts, Graphs, Advertisements - Cognitive Skills- Inference Making - Interpretation		
V	Writing Skills Sentence patterns, Note- making and note taking- Strategies - Paragraph writing: Structure and Principles - Academic Writing - Formal and Informal Letters, Report, Book /Movie Review - Infographics Writing	12	Text Book
	Total	60	Long.

Text Books	1.	https://www.poetryfoundation.org/poems/43588/dover-beach.
	2.	https://portal.abuad.edu.ng/lecturer/documents/1586771577our_earth_will_not_die.doc
	3.	http://l-adam-mekler.com/chucktwo.pdf.
	4.	https://offthewallplays.com/wp-content/uploads/2017/04/1_pdfsam_A-famed-life-full- with-title-page.pdf.
	5.	Nation, I. S. P and Jonathan Newton. 2009. Teaching ESL/EFL Listening and Speaking. Routledge, New York, United States of America.
	6.	Prabha, Dr. R. Vithya& S. Nithya Devi. 2019. Sparkle. (1st Edn.) McGraw - Hill Education, Chennai, India.
Reference Books	1.	Rudzka, Brygida -Ostyn, 2003. Word Power: Phrasal Verbs and Compounds: A Cognitive Approach, Mouton de Gruyter, New York, United States of America
	2.	Swales, John M. & Feak, Christine B. 2012. Academic Writing for Graduate Students: Essential Tasks and Skills, University of Michigan Press, Michigan, United States of America.
	3.	Sen, Leena. 2007. Communication Skills, Second Edition, Prentice Hall India Learning Private Limited, New Delhi, India.
	4.	O. Greene, John. 2021. Essentials of Communication Skill and Skill Enhancement: A Primer for Students and Professionals, Routledge publishers, United Kingdom.

Journal and	https://academic.oup.com/journals
Magazines	
E-Resources and	https://learnenglish.britishcouncil.org/
Website	https://www.cambridgeenglish.org/learning-english/activities-for-learners/
Learning Method	Chalk and Talk/ Assignment/Seminar/ Interactive session
Focus of the	Skill Development/ Employability
Course	



Semester - I Core: CELL BIOLOGY

Semester	Course Code	Course Name	Category	L	Т	P	Credits
I	24BTU1CA	CELL BIOLOGY	CORE	48	12	-	4
Preamble This course has been designed for students to learn and understand • The basic components and functions of cell organelles • The cell signaling, cycle, progression and its regulation • The pathological progressions of a cell							
Prerequisit	e Knowledge o	on Basic of Cell and Cell organ	elles				
Course Ou	tcomes (COs)						
CO Number	Course Outcomes (COs) Statement					Tax ge L	onomy Level
CO1	Define the proce	ess of cell architecture and comp	position			K2	
CO2	Paraphrase the membrane organization for nutrient uptake				ake K2		
CO3	Report the mode of transport relating to inter and K3						
CO4	Sketch signaling	Sketch signaling events within cells K3					
C05	Illustrate the progressions doe	cell cycle events and pa cumentation, inspection and c	athological certification			K3	

Mapping with Program Outcomes:

COs / POs	PO1	PO2	PO3	PO4	PO5
C01	1	1	× .	1	~
CO2	~	1	1	~	~
CO3	1	1	1	~	~
CO4	1	1	×	~	
CO5	1			~	~



Dr.NGPASC

Unit	Content	Hours	E-Contents / Resources
I	History - cell theory – scope – types and shapes - organization of prokaryotic and eukaryotic cell and their differences. Cytoskeleton – microtubules. Nucleus, endoplasmic reticulum (rough and smooth), golgi apparatus, mitochondria, ribosomes, chromosome, chloroplast, lysosome, peroxisome.	13	Text Book
п	Cell membrane - structure and function, transport of nutrients and ions across the membranes. Diversity of plasma membranes (Trilamilar, bimolecular leaflet, lattice, micellar, fluid mosaic model). Desmosomes, plasmodesmata. Cell junctions – adherent, gap and tight junctions.	12	Reference Book
III	Membrane transport types. General classes of transport systems- uniport, symport, antiport. Diffusion- passive and facilitated. Active transport- primary and secondary. The P- type ATPases (Na+K + -ATPase), ion channels (ligand- gated and voltage-gated).	10	Reference Book
IV	Cell Signalling-Intercellular signaling & intracellular signaling- forms of cell signaling-types of receptors-Signalling molecules-Responses to the Signaling Pathway-Termination of Signaling Pathways.	12	Text Book
V	Cell cycle - Mitosis – meiosis and their significance. Cell Ageing – mechanism – theories (Free radical theory and somatic mutation theory). Cell death - necrosis, apoptosis. Difference between necrosis and apoptosis. Mechanism of apoptosis. Characteristics of cancer cell. Tumor cells - Stages of progression.	13	Text Book
	Total	60	



Text Book	1.	Rastogi SC, 2015, "Cell Biology", 3 rd edition, New Age International Publishers, India
Reference Books	1.	Islam A, 2011, "Text Book of Cell Biology", 2 nd edition, Books and Allied (P) Ltd., India
	2.	De Roberties D, 2020, "Cell and Molecular Biology", 8 th edition, Wolters Kluwer New Delhi
	3.	Lodish H & Baltimore D, 2016, "Molecular Cell Biology", 8 th edition, W.H. Freeman & Company, New York, USA
	4.	Karp G, 2002, "Cell and Molecular Biology", 3 rd edition, John Wiley Sons. Inc, USA

Journal and Magazines	Journal of Cell Biology JCB	
E-Resources and Website	physiology.org	

Learning Methods	Power Point, Chalk and Talk
U	

Focus of the	Acquire Knowledge in Basics of Cells and Cell Organelles
Course	



Semester - I Core: MICROBIOLOGY

Semester	Course Code	Course Name	Category	L	Т	P	Credits
I	24BTU1CB	MICROBIOLOGY	CORE	48	12	-	3
Preamble This course has been designed for students to learn and understand • Science of Microbiology and general techniques used • Beneficial and harmful activities of microorganisms to humans • Clinical Applications of microbiology Prerequisite Knowledge on Basic Microbiology							
Course Ou	tcomes (COs)						
CO Number	Course Outcomes (COs) Statement Bloom's Taxonomy Knowledge Level						
CO1	Understand the fundamentals concepts of microbiology K1						
CO2	Know the basics of media preparation and different sterilization techniques, Distinguish different phases in microbial growth and learn about nutritional classificationK2						
CO3	Discuss the structure, reproduction and the causative diseases K3						
CO4	Discuss the structure, reproduction and the causative diseases K3						
CO5	Discuss the structure, reproduction and the causative diseases K3						
3.5 1			2011.5		131-2	31	

Mapping with	Program Outco	omes:			
COs / POs	PO1	PO2	PO3	PO4	PO5
C01	~	1		1	
CO2	~		1	1	1
CO3			1	1	~
CO 4	~	1	~	1	✓
CO5	~	1	1	1	1



Unit	Content	Hours	E-Contents / Resources
I	History of Microbiology - Biogenesis Vs Abiogenesis, Contributions of Louis Pasteur, Robert Koch, Edward Jenner, Alexander Fleming. Microscopy – Bright field or Light, Dark Field, Phase contrast, Fluorescence; Electron Microscopy – Scanning Electron Microscope (SEM), Transmission Electron Microscope (TEM).	12	Text Book
п	Sterilization- Methods - Physical – Dry Heat, Moist Heat, Cold sterilization and Chemical sterilization. Preparation of Culture Media – types. Growth curve - Determination of Generation Time, Measurement of Growth – Viable count, Turbidometry and Direct Cell count. Nutritional classification of microbes.	12	Text Book
Ш	Classification (Bergy's manual) - Bacterial Structure, Reproduction of Bacteria. Diseases caused by <i>Mycobacterium</i> <i>tuberculosis</i> (Tuberculosis), <i>Salmonella typhi</i> (Typhoid), <i>Vibrio cholera</i> (Cholera), <i>Clostridium tetani</i> (Tetanus) and <i>Staphylococcus aureus</i> (Skin Infections), <i>Corynebacterium</i> <i>diptheriae</i> (Diptheria).	12	Reference Book
IV	Virus structure, Classification (Baltimore), Reproduction – Generalized and Specialized, Diseases caused by HIV (AIDS), Hepatitis B Virus (Jaundice), Varicella zoster (Chicken Pox), Polio myelitis (Polio), Viral gastroenteritis (stomach flu), Ebola and Corona virus 2019 (COVID-19).	12	Reference Book
V	Fungal structure - classification - reproduction. Diseases caused by <i>Tinea rubrum</i> (body ring worm), <i>Tinea pedis</i> (athlete's foot), <i>Candida</i> species (bronchitis), <i>Actinomycetes</i> <i>isrelii</i> (oral infection), <i>Aspergillus fumigatus</i> (sinus), Fungal Eye Infections - Keratitis, Endophthalmitis, Yeast infection (Vaginal), Jock itch (<i>Tinea cruris</i>).	12	Text Book
	Total	60	



Text Book	1.	Atlas M Ronald, 2015, "Principles of Microbiology", 2 nd Edition, McGraw-Hill
	1 Charles	Publication, India.
Deference		Palzer M 2001 "Microbiology" 5 th Edition McGrow Hill Education (India) Byt Ltd
Reference	1.	reizal M, 2001, Microbiology, 5 Edition, McGraw rini Education (india) rvt Edu,
Books		India
DOORS		
	2	D'INAL MA 2019 M' 1'1 IST I'' D. I' D. I'' D. I''
	2.	Brij Monan Meena, 2018, Microbiology, 1 ⁻ Edition, Paradise Publisher - Jaipur.
	ALL SO Y	<u>A</u>
and the south and the	1.2	Gerard J T. 2012, "Microbiology: An Introduction", 11 th Edition, Benjamin Cummings
	3.	Statut 1, 2012, Intercencegy,
The Control of the second state		Publishers, USA.
	-	Joanna Willow Kathlaan Sandman, Dorothy Wood, 2020 "Presentt's Microbiology"
	4.	Joanne whiey, Kauneen Sandman, Dorothy wood, 2020, Prescott's Microbiology,
		11 th Edition McGraw Hill Education New York
A REAL PROPERTY AND A REAL		

Journal and Magazines	https://link.springer.com/journal/12088
E-Resources and Website	https://vlab.amrita.edu/?sub=3&brch=76

Learning Methods	Chalk and Talk/Assignment/Seminar	

Focus of the	Skill Development/Employability
Course	



CORE PRACTICAL - I : CELL BIOLOGY AND MICROBIOLOGY

SEMESTER I

Total Credits:2Total Instructions Hours:48 h

S.No	Contents
1	Calculations of Molarity, Normality and Percentage Solution and Preparation of buffer in different pH - Phosphate, Acetate, Tris buffer
2	Microscopic observation of Monocot and Dicot Leaf, Root and Stem section
3	Staining of plant cells - Onion epidermal cells
4	Staining of starch granules
5	Mitotic preparation from onion root tip
6	Enumeration of microorganism from soil by serial dilution method and Pure Culture Techniques
7	Staining of Bacteria-Simple, Negative and Gram staining
8	Staining of Fungi
9	Observation of fungi under stereomicroscope*
10	Bacterial growth curve by turbidimetry method
11	Antibiotic sensitivity test - Kirby Bauer Method
12	Methylene Blue Reduction test

* DBT STAR College Status Experiment



References

- 1 Becker JM, Caldwell GA and Zachgo A, 2007, "Biotechnology– A laboratory Course", 2nd edition, Academic Press, USA
- 2 Davey J and Lord M, 2003, "Essential Cell Biology Volume 1: Practical Approach", 1st edition, OUP Oxford, UK
- 3 Cappuccino, 2005, "Microbiology: A Laboratory Manual", Pearson Education, UK.
- 4 Kannan N, 2002, "Laboratory Manual in General Microbiology", Panima Publishers, India



Semester - I IDC1: CHEMISTRY

Semester	Course Code	Course Name	Category	L	T	P	Credits
I	24CEU1IB	CHEMISTRY	IDC	48	-	-	4
Preamble	 This course has been designed for students to learn and understand The concept of expressing concentration of solutions 						
	• The c	oncepts of Chemical kinetics a	nd catalysis				
	• About	the bonding and basic organic	chemistry				
Prerequisit	e Knowledge o	n BasicChemistry					
Course Out	comes (COs)						
CO Number	Course Outcomes (COs) Statement Bloom'sTaxonomy Knowledge Level				nomy vevel		
C01	Understand the concept of concentration of the solutions K2						
CO2	Infer the acid and basic properties of solutions K2						
CO3	Interpret the concept of the bonding in molecules K2						
CO4	Summarize the basic concepts of the stereo chemistry K2						
CO5	Explain the Chemical kinetics and catalysis				K2		
Mapping with Program Outcomes:							

COs / POs	PO1	PO2	PO3	PO4	PO5
C01	1	1		1	~
CO2		1	1	Sec. 2	~
CO3	~		1	1	
CO4		1		1	
C05	~	1	√		~



Syllabus	5
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Unit	Content	Hours	E-Contents / Resources
I	Solutions Normality, molarity, molality, mole fraction, mole concept. Primary and secondary standards – Preparation of standard solutions. Principle of volumetric analysis (Acid base titrations). Indicators – Theory of indicators- Oswald and quinonoid theory.	10	Text Book
II	Acids and Bases Acid base theories – Strength of acids and bases – Equilibrium constant and ionic constant of water- pH, pKa, pKb, Buffer solution, pH and pOH simple calculations.	08	Reference Book
III	Chemical Bonding Types of bonding - Ionic Bond - Nature of ionic bond - Factors influencing the formation of ionic bond - Covalent and coordinate bond- Molecular Orbital Theory- Configuration of H_2 , N_2 , O_2 , F_2 - Bond order - Diamagnetism and paramagnetism.	10	Text Book
IV	Stereo Chemistry Isomerism, Structural isomerism- Symmetry of elements (Plane, Centre and Axis of symmetry), Optical isomerism of lactic acid and tartaric acid, Enantiomers, Diastereomers – Separation of racemic mixture, Geometrical isomerism (maleic and fumaric acid). R/S and E/Z configuration assignments for simple molecules.	10	NPTEL
V	Chemical Kinetics and Catalysis Rate of reaction, rate law, order, molecularity, first order rate law, half-life period of first order equation, pseudo first order reaction, zero and second order reactions. Catalysis – Homogenous, heterogeneous and enzyme catalysis, Industrial applications of enzyme catalysis.	10	You Tube Videos
	Total	48	



Text Book	1.	Puri. B.R, Sharma. L.R and Pathania. M.S, 2017, "Principles of Physical Chemistry", 47 th edition, John Wiley and Sons & USA.			
Reference Books	1.	ee. J.D, 2002, "A New Concise Inorganic Chemistry", 5 th edition, ELBS & UK.			
	2.	Jain. M.K and Sharma. S.C, 2012, "Modern Organic Chemistry", Vishal publishing Co & New Delhi.			
	3.	Puri. B.R, Sharma. L.R and Kalia. K.C, 2016, "Principles of Inorganic Chemistry", Vishal Publishing & Co & New Delhi			
	4.	D. Nasipuri, 2005, "Stereochemistry of Organic Compounds: Principles and Applications" 2nd edition, New age international Pvt Ltd & New Delhi.			

Journal and Magazines	https://onlinelibrary.wiley.com/journal/10974601
E-Resourcesand	https://tech.chemistrydocs.com/Books/Organic/Stereochemistry-of-Organic-
Website	Compounds-by-D-Nasipuri-Second-Edition.pdf

Learning Method	Chalk and Talk/Assignment/Seminar			



Semester – I

AECC I: ENVIRONMENTAL STUDIES

Semester	CourseCode	CourseName	Category	L	Т	р	Credits
Ι	24MBU1AA	ENVIRONMENTAL STUDIES	AECC	24	-	-	2

Preamble	This coursehas beendesigned forstudents to learn and understand			
	• Multi-disciplinary aspects of Environmental studies			
	• Importance to conserve the biodiversity			
	Causes of Pollutionand its control			
Prerequisite	Aware the basics of environmental components	a church control		
Course Outco	mes (Cos)			
		Bloom's		
CO Number	Course Outcomes (Cos) Statement	Taxonomy		
		Knowledge Level		
C01	To understand the importance of natural resources in order to			
COI	conserveforthefuture	K1		
CO2	To impart knowledge on Natural resources andits conservation	K2		
CO2	To import knowledge on Riodiversity and its conservation			
003	To impart knowledge on biodriversity and its conservation	K3		
CO4	Tocreateawarenessoneffects, causes and control of air, water, soil			
CUT	andnoise pollutionetc.,	K4		
COF	To build awareness about sustainable development and			
CO5	Environmental protection	K1		

Mapping with Programme Outcomes					
Cos/POs	PO1	PO2	PO3	PO4	PO5
CO1	~	1	1	1	1
CO2	\checkmark	1	1	1	~
CO3	~	~	1	~	1
CO4	~	1	1		
CO5	~	1	1	~	1



Dr.NGPASC

Syl	lab	us
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Unit	Content	Hours	E-Contents / Resources
I	Introduction to Environmental studies & Ecosystems: components of environment– atmosphere, hydrosphere, lithosphere and biosphere. Scope and importance - Energy flow in an ecosystem: food chain, food web and ecological succession.	5	Text book an Website
II	Natural Resources: Renewable and Non-renewable Resources: Land Resources and land use - Deforestation: Causes and impacts due to mining, dam building on environment, forests, biodiversity and tribal populations. Conflicts over water (international & inter-state). Energy resources: Renewable and non-renewable energy sources, use of alternate energy sources, growing energy needs.	5	Text book and Website
III	Biodiversity and Conservation: Global biodiversity hotspots. India as a mega-biodiversity nation; Endangered and endemic species of India. Conservation of biodiversity: In-situ and Ex-situ conservation of biodiversity.	4	Text book and Website
IV	Environmental Pollution: types, causes, effects and controls; Air, water, soil, chemical and noise pollution. Nuclear hazards and human health risks. Environment Laws: Environment Protection Act; Prevention & Control of Pollution Act– Air & Water. Wildlife Protection Act; Forest Conservation Act.	5	Text book and Website
v	Environmental ethics: Role of Indian and other religions and cultures in environmental conservation. Role of Information Technology in Environment and human health. Role of the Colleges, Teachers and Students in village adoption towards clean, green and make in villages in various aspects.	5	Text book and Website
	Total	24	and the second



Text	1.	Carson, R.2002. SilentSpring.HoughtonMifflinHarcourt
Book	2.	Gadgil, M., & Guha, R. 1993. This Fissured Land: An Ecological History of India. Univ. of
		CaliforniaPress.
Reference	1.	Gleeson, B. andLow,N. (eds.)1999.GlobalEthics andEnvironment, London,
Books		Routledge.
	2.	Gleick, P.H. 1993. Water in Crisis. Pacific Institute for Studies in Dev., Environment & Compared to the state of the st
		Security. StockholmEnv.Institute,OxfordUniv. Press.
	3.	Groom, Martha J. Gary K.Meffe, and CarlRonald carroll.2006, Principles of
		Conservation Biology. Sunderland: Sinauer Associates.
	4.	Grumbine, R. Edward, and Pandit, M.K.2013. Threats from India's Himalaya dams.
		Science, 339: 36-37.

Journal and Magazines	https://www.hzu.edu.in/bed/E%20V%20S.pdf
E-Resource and Websites	https://www.ugc.gov.in/oldpdf/modelcurriculum/env.pdf

Learning Methods	Chalk and Talk/ Seminar/ Assignment

Focus of the Course	Skill Development/Employability/Social Awareness and Environment

Bos Chairman/HoD

Department of Biotechnology Dr. N. G. P. Arts and Science College Coimbatore – 641 048

	Dr.N.G.P. Arts and Science College				
COMPATION - 1		APPROVED			
BOS- 1776		AC-17+5	GB -		
06.04.24		17.04.24			





		LAN	Semester – II GUAGE: TAMIL	- II			
Semester	Course Code	Course Name	Category	L	T	Р	Credits
II	24TLU2TA	TAMIL - II	LANGUAGE- I	48	12	-	3

Preamble	மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடுநாகரீகம், பகுத்தறிவு ஆகியவற்றை அறியச் செய்தல்
	கலை மற்றும் மரபுகளை அறியச் செய்தல்
	மாணவர்களின் படைப்பாக்கத்திறன்களை ஊக்குவித்தல்
Prerequisite	தமிழ் மொழி எழுதி படிக்கும் திறன்

Course Outcomes (Cos)					
CO. No.	Course Outcomes (COs) Statement	Bloom's Tax anomy Knowledge Level			
CO1	வாழ்க்கைத்திறன்கள் (Life Skills)- மாணவர்களின் செயலாக்கத்திறனை ஊக்குவித்தல்	K2			
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K3			
CO3	பாடஇணைச்செயல்பாடுகள் (Co-curricular activities)	K3			
CO4	சூழலியல் ஆக்கம் (Ecology)	K4			
CO5	மொழி அறிவு (Tamil knowledge)	K4			

Mapping with Program Outcomes:						
Cos / POs	PO1	PO2	PO3	PO4	PO5	
CO1		~	1		~	
CO2	~			1		
CO3		1			1	
CO4			1			
CO5	V .			~	1	



24TLU2TA LANGUAGE: TAMIL - II

Syllabus

Unit	Content	Hrs	Resources
1	அற இலக்கியம் 1. இலக்கிய வரலாறு- பதினெண்கீழ்க்கணக்குநூல்கள் 2.திருக்குறள் அ. அறன்வலியுறுத்தல் – அறத்துப்பால் - அ. எண் - 04 ஆ. காலம் அறிதல் – பொருட்பால் - அ. எண் - 49 இ. உழவு - பொருட்பால் - அ. எண் - 104 ஈ. குறிப்பறிதல் - காமத்துப்பால் - அ. எண் - 110	13	தமிழ்மொ ழிப்பாடம் இரண்டாம் பருவம் 2024-2025
2	அற இலக்கியம் 1. நாலடியார் - அறிவுடைமை 2. மூதுரை - ஔவையார் - 10 பாடல்கள் 6, 7, 9, 10, 14, 16, 17, 23, 26, 30 3. இனியவைநாற்பது- பூதஞ்சேந்தனார் - முதல் 10 பாடல்கள்	13	தமிழ்மொ ழிப்பாடம் இரண்டாம் பருவம் 2024-2025
3	அறநெறிக் கட்டுரைகள் 1. இலக்கியவரலாறு - தமிழ் உரைநடையின் தோற்றமும் வளர்ச்சியும் 2. கலைகள் - உ.வே.சா 3. சங்க நெறிகள் - வ.சுப.மாணிக்கம்	10	தமிழ்மொ ழிப்பாடம் இரண்டாம் பருவம் 2024-2025
4	அறநெறிக் கட்டுரைகள் 1. வீர வணக்கம் - க. கைலாசபதி 2. தமிழர் பண்பாடு - டாக்டர் சோ.நா.கந்தசாமி 3. இணையத் தமிழ் வளர்ச்சி - முனைவர் ப.அர.நக்கீரன்	14	தமிழ்மொ ழிப்பாடம் இரண்டாம் பருவம் 2024-2025
5	பயிற்சிப் பகுதி 1.இலக்கணம் - வழு, வழுவமைதி, வழாநிலை 2.அலுவலகம் சார்ந்த கடிதம் - விண்ணப்பங்கள், வேண்டுகோள், முறையீடு 3.படைப்பாக்கம் - பொதுத்தலைப்பில் கட்டுரைகள் எழுதுதல்	10	தமிழ்மொ ழிப்பாடம் இரண்டாம் பருவம் 2024-2025
	Total	60	



Text book	1.	தமிழ் மொழிப்பாடம் – 2024-2025 தொகுப்பு: தமிழ்த்துறை, டாக்டர் என் ஜி.பி. சுலை வறிலியல் சல்லாசி உ
Reference Books	1.	எஸ்.ஜா.பா. கல்ல அறுவியல் கல்லூரி, கோயம்புத்தூர் – 641048. பேராசிரியர் புலவர் சோம. இளவரசு, தமிழ் இலக்கிய வரலாறு, எட்டாம் பதிப்பு – 2024, மணிவாசகர் பதிப்பகம், சென்னை – 600 108.
	2.	பேராசிரியர் முனைவர் பாக்கியமேரி, முதற் பதிப்பு – 2023, இலக்கணம், இலக்கியவரலாறு , மொழித்திறன் – பூவேந்தன் பதிப்பகம், சென்னை – 600 004.

Journal and Magazines	இலக்கிய இதழ்கள்
E-Resources and Website	https://www.tamilvu.org
Learning Method	Lastread Technical / Gui Last Gui Last (GD) (Last

		177
Focus of the Course	Skill Development / Employability	-



	Semester – II HINDI – II						
Semester	Course Code	Course Name	Category	L	T	P	Credits
II	24TLU2HA	HINDI – II	LANGUAGE- I	48	12	-	3

Preamble	The writing ability and develop reading skill				
	The various concepts and techniques for criticizing literature				
	The techniques for expansion of ideas and translation process				
Prerequisite	To understand the language Hindi for communication				

Course Outcomes (Cos)				
CO. No.	Course Outcomes (COs) Statement	Bloom's Tax anomy Knowledge Level		
CO1	Learn the fundamentals of novels and stories	K2		
CO2	Understand the principles of translation work	K3		
CO3	Expose the knowledge writing critical views on fiction	K3		
CO4	Build creative ability	K3		
CO5	Apply the power of creative reading	K4		

Mapping with Program Outcomes:						
Cos / POs	PO1	PO2	PO3	PO4	PO5	
CO1		~	1		1	
CO2	×					
CO3		~			1	
CO4			~			
CO5	~			~	1	



24TLU2HA LANGUAGE: HINDI – II

Syllabus

Unit	Content	Hrs	Resources
1	आधुनिकपद्य - शबरी(श्रीनरेशमेहता)	13	Text Book
2	उपन्यासः सेवासदन-प्रेमचन्द	13	Text Book
3	कहानी-किरीट- डा उषा पाठक / डा अचला पाण्डेय पाठ 1.कफ़न, 3. चीफ़ की दावत	12	Text Book
4	पत्र लेखन: (औपचारिक या अनौपचारिक)	12	Text Book
5	अनुवाद अभ्यास-III (केवल हिन्दी से अंग्रेजी में) (पाठ 1 to 10)	10	Text Book
	Total	60	

Text books	1.	प्रकाशक: लोकभारती प्रकाशन पहली मंजिल, दरबारी बिल्डिंग,महात्मा गाँधी मार्ग, इलाहाबाद.
		(Unit I)
	2.	प्रकाशक: सुमित्र प्रकाशन 204 लीला अपार्ट्मेंट्स, 15 हेस्टिंग्स रोड'अशोक नगर इलाहाबाद.
		(Unit II)
	3.	प्रकाशक: राधाकृष्ण प्रकाशन दिल्ली. (Unit III)
	4.	पुस्तक: व्याकरण प्रदिप - रामदेवप्रकाशक: हिन्दी भवन 36 इलाहाबाद. (Unit IV)
	5.	प्रकाशक: दक्षिण भारत प्रचार सभा चेनैई. (Unit V)

Learning Method	Lecture/ Tutorial / Student Seminar/GD/Assignment	

Focus of the Course Skill Development / Employability



Semester – II LANGUAGE: MALAYALAM- II								
Semester	Course Code	Course Name	Category	L	Т	P	Credits	
II	24TLU2MA	MALAYALAM- II	LANGUAGE- I	48	12	-	3 .	

Preamble	The writing ability and develop reading skill				
The various concepts and techniques for criticizing literature, to learn the					
	The competency in translating simple Malayalam sentences into English and vice versa				
Prerequisite	To understand the language Malayalam for communication				

Course Outcomes (Cos)					
CO. No.	Course Outcomes (COs) Statement	Bloom's Tax anomy Knowledge Level			
CO1	Learn the fundamentals of novels and stories	K2			
CO2	Understand the principles of translation work	K3			
CO3	Expose the knowledge writing critical views on fiction	K3			
CO4	Apply creative ability	K3			
CO5	Build the power of creative reading	K4			

Mapping with Program Outcomes:					
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1		1	1		1
CO2	1			1	
CO3		1			1
CO4	u a		1		
CO5	~			~	1



24TLU2MA LANGUAGE: MALAYALAM- II

Syllabus

Unit	Content	Hrs	Resources
1	Novel Enmakaje: Chapter1- Chapter 5	14	Text book
2	Novel Enmakaje: Chapter 6- Chapter 10	10	Text book
3	Novel Enmakaje: Chapter 11- Chapter 15	14	Text book
4	Autobiography Neermathalam Pootha Kalam: Chapter 1- Chapter 10	10	Text book
5	Autobiography Neermathalam Pootha Kalam: Chapter 11- Chapter 20	12	Text book
	Total	60	

Text books	1.	Ambika Suthan Mangad, Enmakaje (Novel), DC Books Kottayam, Kerala, India.
		(Unit I to III)
	2.	Madhavikkutty, Neermathalam Pootha Kalam (Autobiography), DC Books
a ser a ser a ser		Kottayam, Kerala, India. (Unit IV & V)
Reference	1.	Malayala Novel Sahithyam, DC Books Kottayam, Kerala, India
Books	2.	Malayala Sahithya Charithram, National Books Kottayam, Kerala, India.

Learning Method Lecture/ Tutorial / Student Seminar/GD/Assignment

Focus of the Course Skill Development / Employability



		Se	mester – II		-		
		LANGUA	GE: FRENCH -	Π			
Semester	Course CodeCourse NameCategoryLTPCredits						Credits
II	24TLU2FA	FRENCH - II	LANGUAGE- I	48	12	-	3

Preamble	The competence in general communication skills with oral, written and comprehension & expression
A DOT	The culture, life style and the civilization aspects of the French people as well as of France
en a se	The students to acquire competency in translating simple French sentences into English and vice versa
Prerequisite	To understand the language French for communication

Course Outcomes (Cos)					
CO. No.	Course Outcomes (COs) Statement	Bloom's Tax anomy Knowledge Level			
CO1	Learn the Basic verbs, numbers and accents	К2			
CO2	Apply the adjectives and the classroom environment in France	К3			
CO3	Select the Plural, Articles and the Hobbies	К3			
CO4	Measure the Cultural Activity in France	К3			
CO5	Evaluate the sentiments, life style of the French people and the usage of the conditional tense	K4			

Mapping with	Mapping with Program Outcomes:				
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1		1	1		1
CO2	~			~	
CO3		×			1
CO4	Lanti		1	1.00	
CO5	1			1	1



24TLU2FA LANGUAGE: FRENCH - II Syllabus

Unit			(Content		Hrs	Resources
1.	Proposer, accepter, refuserune invitation. Indiquer la date.	Organise soirée au avec des par télép par courr	r une cinéma amis, hone et riel.	Comprendr d'invitation Inviter quel ourefuserl'i	Comprendreunemessage d'invitationsurunrépondeurtéléphonique. Inviter quelqu'un accepter ourefuserl'invitation.		Text book
2	Prendreet fixer rendez-vous. Demander etindiquerl'heu	un ıre.	Organise soirée au avec des téléphor courriel.	er une 1 cinéma 5 amis, par ne et par	Comprendre des personnes qui fixentunrendez-vous par téléphonique. Prendreun rendez-vous par telephone	12	Text book
3	Exprimer son vue positif et n S'informersur l S'informersur l quantitité. Exprimer la gu	point de égatif. le prix. la antitité.	En grou un cade ami.	pes, choisir au pour un	Exprimer son point de vuesur des idées de cadeau. Faire des achatsdans un magasin	14	Text book
4	Demander etindiquerune direction. Localiser (prè face de). Exprimerl'obli Interdit.Conse	es de, en gationl' iller.	Suivre ur l'aided'in par telep plan. Par courrieré donner informat conseils veut voy	n itinéraire à dications hone et d'un électronique, des ions et des à un ami qui ager.	Comprendre des indications de direction. Comprendre des indications de lieu. Comprendreune chanson. Comprendre de courts messages qui experiment l'obligationoul'interdiction. Donner des conseils à des personnesdans des situations données.	10	Text book
5	Practical App Make in Own S	lication Sentences				10	-
				Total		60	

Text book	1.	Regine Merieux, Yves Loiseau, "LATITUDES - 1" (Page No: 56-101) (Methode de Français), Goyal Publisher & Distributors Pvt.Ltd., 86 UB Jawahar Nagar (Kamala Nagar), New Delhi-7 Les Editions Dider, Paris, 2008- Imprime en Roumanie par Canale on Janvier 2012. (Unit I to IV
		En janvier 2012. (Oner to 1.

Learning Method	Lecture/ Tutorial / Student Seminar/GD/Assignment
Livering	



Fornsof the Course

Skill Development / Employability

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B.Sc. Biotechnology (Students admitted during the AY 2024-25)

		Semester LANGUAGE: EI	– II NGLISH - II				Gudita
Somester	Course Code	Course Name	Category	Ļ	T	<u> </u>	Creans
II	24ELU2EA	ENGLISH – II	LANGUAGE – II	48	-	12	3

Preamble	 This course has been designed for students to learn and understand language for specific purposes through literary works, enhancing listening and reading skills. communicative competencies in academics through real-world contexts, improving speaking and listening. business correspondence with clarity and accuracy, focusing on writing skills like emails and essays.
Prerequisite	Basic knowledge of English Language

Course Ou	itcomes (Cos)	Bloom's Taxonomy
CO Number	Course Outcomes (COs) Statement	Knowledge Level
C01	Interpret spoken English through active listening and respond effectively.	K1
CO2	Express effective speaking skills through structured and informal discussions.	K2
CO3	Analyse and comprehend literary and informational texts to enhance reading proficiency.	K2
CO4	Compose written content with clarity and coherence in various contexts.	K3
CO5	Apply essential soft skills for professional interactions, leadership, and communication.	K3

Cos / POs	PO1	PO2	PO3	PO4	PO5
C01			1		
CO2			1		1
CO3			1		
CO4			1		
CO5			1		1



24ELU2EA LANGUAGE: ENGLISH - II Syllabus

TT*	Content	Hrs	Resources
Uni	Listening		
Ι	Poem: Edgar A. Guest – Don't Quit Repetition for emphasis - Tone and Emotional appeal Langston Hughes – Still Here Voice & Identity - Resilience & Endurance. Short Story: R.K. Narayan – Engine Trouble Emotional tone – Question for Reflection Listening Talks: ""Yes, We Can!" - Barack Obama (speech) – (Audio & Visual aids) Communication	12	https://poetryace.com/ im-still-he re/
11	Grammar: Articles & Trepositions Speaking Poem: Robert Frost – The Road not Taken Persuading and supporting opinions – logical structure – clear articulation D. H Lawrence – Snake Observation and Patience - Respect and Humility Speaking Skills: Just a Minute Talk (JAM) – Small Talk, Interviewing a Celebrity. Crammar: One word substitution, Loan Words.	12	www.poetrysoup.com
I	Reading Poem: Chinua Achebe – Love Cycle Inferring and Interpreting - Synthesis of Ideas Connection and Understanding - Adaptability and Growth Short story: Sudha Murthy – How I taught My Grandmother to Read Building comprehension – Fluency & Expression Grammar: Syllabification, Mon/Di/polysyllabic Comparison - Odd one Out - Rearranging the sentences	12	<u>ht</u> tps://www.poetryfoun dation.org/poems
1	Umbled sentences). Writing Prose: A. G. Gardiner: On Letter Writing Clarity and Precision – Self expression Writing Skills: Story Building, Story Writing & Story Narration Emails (formal/informal) & General Essay Writing - (Descriptive or Narrative) Grammar: Spelling Pitfalls (wrongly spelt words),	12	https://www.gutenberg. org/
	V Soft Skills Expressing opinions through Role play– Interview Skills - Public Speaking - Group Discussions - Leadership Qualities - Communication on Verbal and Non-verbal	12	Social intelligence: The new science of human relationships - Daniel Goleman; 2006.
	Total	60	



Note	Clas	ssroom activities on LSRW skills (Examine Internal only)
Text Books	1.	Martin Hewings. Advanced English Grammar. Cambridge University Press, 2000.
	2.	SP Bakshi, Richa Sharma. Descriptive English. Arihant Publications (India) Ltd., 2019.
5	3.	Sheena Cameron, Louise Dempsey. The Reading Book: A Complete Guide to Teaching Reading. S & L. Publishing, 2019.
	Phil Chambers. Brilliant Speed Reading: Whatever you need to read, however. Pearson, 2013.	
	5.	Bailey, Stephen. Academic Writing: A Practical Guide for Students. Routledge, 2004.
	6.	Goleman, Daniel. Social Intelligence: The New Science of Human Relationships. Bantam Books, 2006.
Reference	1.	Nesfield, J. C. English Grammar Composition and Usage. Macmillan, 2019.
Books	2.	Krishnasamy. N. Modern English: A Book of Grammar, Usage and Composition. Macmillan, 1975.
- This was in the second	3.	Kumar, Ramendra. Stories of Resilience. Blue Rose Publications, 2020.
2	4	Thakur, SJ and Rout, S.K. Objective General English, B.K Publications, 2017.

Journals and Magazines	IOSR Journal of Humanities and Social Science (IOSR-JHSS) International Journal of English Literature and Social Sciences http://ijrep.com/wp-content/uploads/2019/03/18-22-SKILL-ENHANCEMENT- TEACHING-LSRW https://www.jetir.org/view?paper=JETIRDY06148
E-Resources	https://learnenglish.britishcouncil.org/
and Website	https://www.yourarticlelibrary.com/

Learning Method Chalk and Talk/Assignment/Seminar/ Group Discussion

Focus of the Course	Skill Development/ Employability	



		Semester - I CORE: GENET	I TCS				
Semester	Course Code	Course Name	Category	L	Т	P	Credits
II	24BTU2CA	GENETICS	CORE	48	12	-	4

Preamble This course has been designed for students to real interaction • Concepts of Mendelian and Non-Mendelian inheritant • Theory of inheritance and gene interaction • Overview on genetic disorders Prerequisite Knowledge on genes and chromosomes Course Outcomes (COs)		ritance
Course Or CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand the history and concept of Mendelian laws	K2
CO2	Recognize the structure of chromosome, gene and its interaction	K2
CO3	Interpret chromosomal variations and genetic disorders	К3
CO4	Differentiate the natural horizontal gene transfer methods	К3
C05	Classify the pedigree analysis and understand the population genetics	К3

Aapping with	Program Ou	tcomes:	ingengand - 1 da	a notes a	
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	1	1	1	1	~
CO2	1	1	1	~	1
CO3	1	1	1	1	1
CO4	1	1	1	1	
CO5	1			1	1



24BTU2CA	CORE: GENETICS
24DIUZCA	CORE: GENETICS

Unit	Content	Hours	E-Contents / Resources
I	Mendelian & Non - Mendelian Inheritance: History of Genetics, Mendel's work: Choice of experimental plant, Monohybrid Experiment, Dihybrid Experiment, Back Cross and Test Cross. Chromosomal theory of Inheritance, Extranuclear inheritance, Maternal inheritance	12	Textbook
II	Concept of Gene, Alleles and Chromosome: Gene vs Allele, Multiple Alleles, Pseudo alleles, Lethal genes. Gene Interactions: Allelic (Co- Dominance, Incomplete Dominance and pseudo-dominance), Non - Allelic (Epistasis). Concept of loci on Chromosome, Structure of Prokaryotic and Eukaryotic chromosome, Karyotyping and ploidy	12	Reference book
III	Chromosomal Variations and Aberrations: Mutation - Spontaneous mutations and Induced mutations. Structural (deletion, duplication, inversion and translocation). Single Gene Disorders: Autosomal Dominant- Achondroplasia, Polycystic kidney, Autosomal Recessive –Cystic fibrosis, Sickle cell Anaemia. X-linked Dominant-Rett syndrome. X-linked Recessive-Haemophilia, Multifactorial- Cleft lip and palate, Y-linked inheritance	12	https://my.cleveland clinic.org/health/diseases/21751- genetic-disorders
IV	Natural Horizontal Gene Transfer Methods: Genetic analysis of bacteria - Bacterial transformation, Conjugation (sex factor, Hfr strain, F'factor), Transduction in Bacteria (General and Specialized), Linkage and Crossing over, Recombination – Holliday model	12	Reference book
V	Transposons and Population Genetics:Model organism for genetic	12	Reference book



analysis of development- Drosophila & Arabidopsis. Transposable elements of Prokaryotes (IS Elements, Composite and Tn3 Family) and Eukaryotes (Maize transposable elements). Gene frequency, Hardy–Weinberg law, calculating gene frequency, factors affecting gene frequency, Pedigree analysis		
Total	60	

Text Book	1.	Strickberger MW, 2013, "Genetics", 3 rd Edition, Prentice Hall College Division, NewDelhi
Reference Books	1.	Winter PC, Hickey GI and Fletcher HL, 2000, "Genetics", 1 st Edition, VivaBooks Pvt Ltd., India
	2.	Trun N and Trempy J, 2004, "Fundamental Bacterial Genetics", Black well publishing, Singapore
	3.	Strachan T and Read AP, 2006, "Human Molecular Genetics", 3 rd Edition, Wiley & Sons, United States
	4.	Brown TA, 1999, "Genetics", 3 rd Edition, Chapman and Hall, London, UK

Journal and Magazines	https://www.frontiersin.org/journals/genetics https://academic.oup.com/genetics			
E-Resources and Websitehttps://conferences.nature.com/event/96270d72-3b34-44cf-b494- 93997800e355/summary				
	https://www.shcollege.ac.in/wp- content/uploads/NAAC_Documents_IV_Cycle/Criterion- II/2.3.2/ppt/Dr_Gibykuriakose_Transposibleelements.pdf			

Learning Seminars /assignments/Chalk and talk Methods	
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Focus of the	Skill development and employability and entrepreneurship
Course	



Semester - II CORE: BIOCHEMISTRY							
Semester	Course Code	Course Name	Category	L	Т	P	Credits
II	24BTU2CB	BIOCHEMISTRY	CORE	48	12	-	3

Preamble Prerequisi	 This course has been designed for students to learn and the structure & function of bio molecules The structure & function of bio molecules The aspects of metabolism & their regulatory pather of the classification, structure, functions of the metabolism te Knowledge on Basics of Biomolecules Structure and Functions 	inderstand hways biomolecules and its nctions	
Course Ot CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level	
C01	Identify the concepts of biochemical pathways and carbohydrates	К2	
CO2	Paraphrase the classification, structure, properties and K2 metabolism of amino acids and protein		
CO3	Discuss the classification, structure, properties, biosynthesis and oxidation of lipids	К3	
CO4	Compare the classification, structure, functions of nucleic acids and metabolism of nucleotides	К3	
CO5	Categorize the classification of enzymes, mechanism of action and enzyme kinetics	К3	

Mapping with Program Outcomes:					
COs / POs	PO1	PO2	PO3	PO4	PO5
CO1	1	1	1	1	1
CO2	1	1	~	1	1
CO3	1	1	~	×	~
CO4	1	1	V	~	
C05	1			1	~



24BTU2CB	CORE: BIOCHEMISTRY
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Unit	Content	Hours	E-Contents / Resources	
I	Structure, classification and functions of carbohydrates, Glycoproteins, Glycolipids Glycolysis, gluconeogenesis and Krebs's cycle. Electron transport chain, Glyoxylate cycle, Glycogen synthesis and breakdown.	12	https://www. biochemistry.org/ publications// Indian Journal of Biochemistry	
п	I Lipids: Nomenclature, Classification and biological significance. Simple Lipids and Compound lipids. Synthesis and metabolism of fatty acids (α , β and ω Oxidation of fatty acids). Cholesterol Biosynthesis.			
III	Amino acid: Biosynthesis of amino acids, Essential and non essential amino acids, Properties and Metabolism of amino acid (Glycine). Protein: Classification and Properties – four levels of protein structure & conformations. Ramachandran Plot.	12	https://www.biochemistry.org/ publications// Indian Journal of Biochemistry	
IV	Enzymes: Nomenclature and Classifications. Coenzymes, Abzymes and Ribozymes. Mechanism of enzyme actions - Active site, Lock and Key model & Induce fit Hypothesis, Enzyme substrate complex formation. Kinetics: Derivation of Michaelis- Menton equation.	12	<u>http://nmc.itc.virginia.edu/</u> pmh3g/enter.htm	
v	Nucleic acids: Classification, structure and functions of nucleic acids, Biosynthesis of Purines and pyrimidines -De novo pathway, Salvage pathway. Metabolism and regulations of Purine and Pyrimidine.	12	http://nmc.itc.virginia.edu/ pmh3g/enter.htm	
	Total	60		



Text Book	1.	Rodwell, V.W,Bender D.A, Botham K. M, Kennelly P.J, and Weil P A, 2018, Harper's Illustrated Biochemistry, 31 st Edition, McGraw Hill publications, New Delhi.
Reference Books	1.	Berg, J.M., Stryer, L. et al. 2015, Biochemistry, 8 th Edition, Palgrave Macmillan Publications, India
	2.	Lehninger, A.L. and Cox, M. M. 2013. Principles of Biochemistry. 6 th Edition. W. H. Freeman and Company, New York
	3.	Voet, D. and Voet, J. G. 2011. Biochemistry. 4 th Edition. John Wiley and Sons Inc. USA
	4.	Fromm, H.J. and Hargrovem M. 2012. Essentials of Biochemistry, Springer publisher

Journal and Magazines	https://www.biochemistry.org/publications// Indian Journal of Biochemistry
E-Resources and Website	http://nmc.itc.virginia.edu/pmh3g/enter.htm

Learning Methods	PPT and ICT Tools	
	and the second se	

Focus of the	Skill Development and Employability
Course	



	CORE PRA	Semester – II ACTICAL: GENETICS AN	D BIOCHEM	ISTI	RY		
Semester	Corse Code	Course Name	Category	L	T	P	Credits
II	24BTU2CP	CORE PRACTICAL: GENETICS AND BIOCHEMISTRY	CORE		-	48	2

Preamble	 This course has been designed for students to learn and understand the basic functions of genes and alleles the role of environmental factors in gene functions the measurement and analysis of biomolecules in the samples
Prerequisite	Knowledge on genes and Biomolecules

Course Or	utcomes (Cos)	
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Infer the functions of alleles in genetic diversity	K2
CO2	Understand the concept of mutation and its role	K2
CO3	Assess the amount of carbohydrates in various samples and interpret the results	K2
CO4	Quantify the aminoacids and proteins in various samples and interpret the results.	K2
CO5	Measure the amount of nucleic acids and interpret the results	К3

Cos/POs	PO1	PO2	PO3	PO4	PO5
CO1	✓	1			1
CO2	1	1			1
CO3	1	1	1	1	1
CO4	1	1	1	1	✓
CO5	1	1	1	1	1



24BTU2CP CORE PRACTICAL: GENETICS AND BIOCHEMISTRY

S	.No	Contents
	1	Sex chromatin observation from Buccal smear *
	2	Blood typing in humans for multiple alleles and Rh factor
	3	Problem solving in Pedigree Analysis
	4	Isolation of UV induced mutants
	5	Isolation of auxotrophic mutants
	6	Estimation of Glucose by Anthrone method*
	7	Estimation of Fructose by Dinitro Salicylic Acid method
	8	Estimation of Amino acids by Ninhydrin method
	9	Estimation of Protein by Lowry's or Bradford's method
	10	Estimation of DNA by diphenylamine method
	11	Estimation of RNA by Orcinol method
	12	Determination of Ascorbic acid by volumetric method

Note: *DBT STAR College Experiment.

Manuals	1.	Sambrook J, Green M R, 2012, "Molecular Cloning: A Laboratory manual",4 th Edition, Cold Spring Harbor, USA
	2.	Sadasivam, S. and Manickam, A, 1996, "Biochemical Methods", 4 th edition, New Age International, India

Learning Method	Demonstration/	Hands on Experiments/	GroupTrials

Focus of the Course	Skill Development/ Employability/ Innovations
Focus of the Course	Skill Development/ Employability/ Innovations



	Semester – II IDC: BIOPHYSICS						
Semester	Course Code	Course Name	Category	L	T	P	Credits
II	24PYU2IA	BIOPHYSICS	IDC	48	-	-	4

Preamble	This course has been designed for students to learn a	This course has been designed for students to learn and understand				
	 The basic concepts of biophysics The techniques and applications of biophy The importance of radiation in biology 	sics				
nPrerequis	ite Basic Knowledge on Biophysics	and the second second second				
Course Out	comes (COs)					
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level				
CO1	Understand the concepts of Biophysics.	K2				
CO2	Explain the Bioenergetics, Oxidation and Reduction process	K2				
CO3	Identify the types of Centrifugations and Chromatography.	К3				
CO4	Outline the concepts of radiation biology.	K2				
CO5	Make use of Polymerase Chain reaction and Lyophilizes in applications.	К3				

COs / POs	PO1	PO2	PO3	PO4	PO5
C01	~	~	1		1
CO2				1	
CO3	~	1	1	Malloury	1
CO4	1	1	1	1	1
C05					(1, 1)



Dr.NGPASC

24PYU2IA IDC: BIOPHYSICS

Syllabus

Unit	Content	Hours	E-Contents / Resources
I	Fundamental concepts Introduction to chemical bonds - Molecules - Acids and bases - Buffer systems - Nature of Light - Properties of Light - Fluorescence - Phosphorescence - Bioluminescence - Physical characteristics - Significance of Bioluminescence, Functions.	10	Text Book
Π	Bioenergetics, Oxidation and Reduction Laws of Thermodynamics - Concept of free energy		Text Book
	bioenergetics - Mitochondrial bioenergetics - ATP bioenergetics - Oxidation - Oxidizing agent - Reduction - Reducing agent - Redox Reactions - Redox Potential.	10	
III	Centrifugation and Chromatography	09	Text Book
	Types of centrifuges - Methods of centrifugations - Buoyant density centrifugation - Applications of ultracentrifugation - Principles of Chromatography Types of Chromatography - Paper Chromatography - Thin Layer Chromatography - Ion Exchange Chromatography.		
IV	Radiation Biology	09	·Text Book
	Radioactive Isotopes – Radioactivity - Carbon dating - Radioactive decay - Half life - Effects of Radiations on Biological systems - Radiation dosimetry: Autoradiography - Cerenkov Radiation.		
V	Polymerase Chain reaction and Lyophilizers	10	Text Book
	Instrumentation - Principle and method - Single sided PCR - Inverse PCR - Random PCR - RT-PCR - Applications of PCR - Principles of Lyophilizers - Instrument - Steps in Lyophilization, Applications.		
	TOTAL	48 h	



Text Book	1.	Arumugam N, Kumaresan V, 2013, "Biophysics and Bioinstrumentation", 1st Edition, Saras Publication, Tamilnadu, India.		
	2.	Subramanian MA, 2005, "Biophysics: Principles and techniques", 2nd edition, MJP Publishers, Tamilnadu, India		
Reference Books	1.	Rodney Cotterill , 2002, "Biophysics - An Introduction", 1st edition, Wiley & Sons Ltd, United States		
	2.	Pranab Kumar , 2010, " Introduction To Bio Physics ",First Edition, S Chand & Company, India.		
	3.	David Burns ,2018, " An Introduction to Biophysics ", 1st edition, Forgotten Books,Publication, United States.		
	4.	Parke, William C, 2020, "Biophysics: A Student's Guide to the Physics of the Life Sciences and Medicine ", 1st edition, Springer International Publishing, United States		
Journal an Magazines	d s	https://doi.org/10.1016/j.bbamem.2016.12.002		
E-Resources and Website		https://link.springer.com/journal/10867		
Learning Method		Chalk and Talk/Assignment/Seminar		
Focus of t Course	he	Skill Development/ Employability/Innovations		



Semester – II AECC: BASIC TAMIL							
Semester	Course Code	Course Name	Category	L	Т	P	Credits
II	24TLU2AA	BASIC TAMIL	AECC	24	-	-	2

Preamble	பிறமொழி பயிலும் மாணவர்களுக்கு அடிப்படைத் தமிழ் எமுக்குக்களைக் அறியக் தெய்தல்
	தமிழ்மொழியில் உள்ள உயிர், மெய், உயிர்மெய் எழுத்துக்களைக் எழுதச் செய்தல்
	தமிழ்மொழியில் உள்ள அடிப்படைச் சொற்களை எழுதி, படிக்கச் செய்தல்
Prerequisite	தமிழ்மொழியினை முறையாக எழுதிப் படிக்கும் திறனை வளர்த்தல்

Course O	Course Outcomes (Cos)					
CO. No.	Course Outcomes (COs) Statement	Bloom's Tax anomy Knowledge Level				
CO1	வாழ்க்கைத்திறன்கள் (Life Skills)- மாணவர்களின் செயலாக்கத்திறனை ஊக்குவித்தல்	K2				
CO2	மதிப்புக்கல்வி (Attitude and Value education)	K3				
CO3	பாடஇணைச்செயல்பாடுகள் (Co-curricular activities)	K3				
CO4	சூழலியல் ஆக்கம் (Ecology)	K4				
CO5	மொழி அறிவு (Tamil knowledge)	K4				

Mapping with	Mapping with Program Outcomes:				
Cos / POs	PO1	PO2	PO3	PO4	PO5
CO1		~	~		1
CO2	~			~	
CO3		~			1
CO4			~		
CO5	~			~	1



Dr.NGPASC

24TLU2AA AECC: BASIC TAMIL

இளங்கலை 2024 –25 ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது (10 மற்றும் 12 – ஆம் வகுப்பு வரை தமிழ் மொழிப்பாடம் பயிலாதவர்களுக்கு)

(பருவத் தேர்வு இல்லை)

Syllabus

	Content	Hrs	Resources
Unit 1	தமிழ் மொழியின் அடிப்படைக் கூறுகள் எழுத்துகள் அறிமுகம் 1. உயிர் எழுத்துக்கள் - குறில் , நெடில் எழுத்துகள் 2. மெய் எழுத்துக்கள் - வல்லினம், மெல்லினம், இடையினம் 3. உயிர்மெய் எழுத்துக்கள்	05	அடிப்படைத் தமிழ்மொழிப் பாடம் இரண்டாம் பருவம் 2024-2025
2	4. பயிற்சி சொற்களின் அறிமுகம் 1.பெயர்ச்சொல் 2.வினைச்சொல் – விளக்கம் (எ.கா.) 3.பயிற்சி	05	அடிப்படைத் தமிழ்மொழிப் பாடம் இரண்டாம் பருவம் 2024-2025
3	குறிப்பு எழுதுதல் 1. பெயர், முகவரி, பாடப்பிரிவு , கல்லூரியின் முகவரி 2. தமிழ் மாதங்கள்(12), வாரநாட்கள்(7) 3. எண்கள் (ஒன்று முதல் பத்து வரை), வடிவங்கள், வண்ணங்கள்	05	அடிப்படைத் தமிழ்மொழிப் பாடம் இரண்டாம் பருவம் 2024-2025
4	குறிப்பு எழுதுதல் 1. ஊர்வன, பறப்பன, விலங்குகள் 2.மனிதர்களின் உறவுப்பெயர்கள் 3. ஊர்களின்பெயர்கள் (எண்ணிக்கை 10)	05	அடிப்படைத் தமிழ்மொழிப் பாடம் இரண்டாம் பருவம் 2024-2025
5	பயிற்சிப் பகுதி (உரையாடும் இடங்கள்) வகுப்பறை, பேருந்து நிலையம், சந்தை– பேசுதல்,எழுதுதல்.	04	அடிப்படைத் தமிழ்மொழிப் பாடம் இரண்டாம் பருவம் 2024-2025
	Total	24	



Notes:

அகமதிப்பீட்டுத்தேர்வு மலிப்படன்கள் 50	– ഖി	னாத்தாள்	அமைப்புமுறை-	மொத்த
யதாபல்பலைகள் - 50				
	L	பகி⊇ – அ		
சரியான விடையைத் தேர்வு	செய்தல்		10x2=20	
	L	பகு து –ஆ		
சரியா? தவறா?	:	L0x2=20		
	L	கதி – இ		
ஒரு பக்க அளவில் விடையஎ	ரிக்க	1x10=	10	

குறிப்பு:

- அனைத்து அலகுகளில் இருந்தும் வினாக்கள் அமைதல் வேண்டும்
- பகுதி இ–க்கான வினாக்கள் இதுஅல்லது அதுஎன்ற அடிப்படையில் அமைதல் வேண்டும்

Text book	1.	அடிப்படைத் தமிழ் - 2024-2025 தொகுப்பு: தமிழ்த்துறை, டாக்டர்என்.ஜி.பி. கலை அறிவியல் கல்லூரி, கோயம்புத்தூர் – 641048.
Reference Books	1.	ஒன்றாம் வகுப்பு பாடநூல் - தமிழ்நாடு அரசு பாடநூல் கழகம், சென்னை.

E-Resources and Website	https://www.tamilvu.org	
Website	indpoint in a mainine during	

Learning Method	Lecture/ Tutorial / Student Seminar/GD/Assignment

Focus of the Course Skill Development / Employability



	المراجع المجاري	Semeste AECC: ADVANC	er – II CED TAMIL				
Semester	Course Code	Course Name	Category	L	Т	Р	Credits
II	24TLU2AB	ADVANCED TAMIL	AECC	24	-	-	2

Preamble	மொழிப்பாடங்களின் வாயிலாக தமிழரின் பண்பாடு நாகரீகம்,
TTOMAN	பகுக்கறிவ ஆகியவற்றை அறியச் செய்தல்
	கலை மற்றும் மரபுகளை அறியச் செய்தல்
	பாணவர்களின் படைப்பாக்கத்திறன்களை ஊக்குவித்தல்
	பாண்வர்களை உடையாக எழுகிப் படிக்கும் திறனை
Prerequisite	
	வளரத்தல

CO. No. Course Outcomes (COs) Statement வாழ்க்கைத்திறன்கள் (Life Skills)-	Knowledge Level
வாழ்க்கைத்திறன்கள் (Life Skills)-	К2
201 மாலைவர்களான செயலால் தெற்று கான ஊக்குவிக்கல்	Server Filter and
CO2 மதிப்புக்கல்வி (Attitude and Value education)	К3
CO3 பாடஇணைச்செயல்பாடுகள் (Co-curricular activities)	K3
CO4 சூழலியல் ஆக்கம் (Ecology)	K4
CO5 மொழி அறிவு (Tamil knowledge)	K4

C / DOr	PO1	PO2	PO3	PO4	PO5
Cos/PUs	101	104			
CO1		1	1	the shall will be	~
CO2	1			~	
CO3		~			1
CO4			~		
005				~	~



24TLU2AB AECC: ADVANCED TAMIL

இளங்கலை 2024– 2025ஆம் கல்வியாண்டு முதல் சேர்வோர்க்குரியது (10 மற்றும் 12 – ஆம் வகுப்புகளில் தமிழ் மொழிப்பாடம் பயின்றவர்களுக்கு உரியது)

(பருவத் தேர்வு இல்லை)

Syllabus

Unit	Content	Hrs	Resources
1	கவிதைகள் 1. தமிழ்நாடு - பாரதியார் 2.மனதில் உறுதி வேண்டும் - பாரதியார் 3. இன்பத்தமிழ் - பாரதிதாசன் 4.வேலைகளல்லவேள்விகள் - தாராபாரதி 5.தமிழா! நீ பேசுவது தமிழா! - காசியானந்தன் 6. நட்புக் காலம் (10 கவிதைகள்) - அறிவுமதி கவிதைகள்	05	சிறப்புத் தமிழ்மொழிப் பாடம் இரண்டாம் பருவம் 2024-2025
2	கட்டுரை கட்டுரைத் தொகுப்பு - நல்வாழ்வு - டாக்டர் மு.வரதராசன் 1. நம்பிக்கை 2. புலனடக்கம் 3. பண்பாடு	05	சிறப்புத் தமிழ்மொழிப் பாடம் இரண்டாம் பருவம் 2024-2025
3	இலக்கணம் 1.வல்லினம் மிகும் மற்றும் மிகா இடங்கள் 2. ர,ற,ல,ழ,ள,ந,ண,ன – வேறுபாடு அறிதல்	05	சிறப்புத் தமிழ்மொழிப் பாடம் இரண்டாம் பருவம் 2024-2025
4	கடிதங்கள் 1. பாராட்டுக் கடிதம் 2. நன்றிக் கடிதம் 3. அழைப்புக் கடிதம் 4. அலுவலக விண்ணப்பங்கள்	05	சிறப்புத் தமிழ்மொழிப் பாடம் இரண்டாம் பருவம் 2024-2025
5	பயிற்சிப் பகுதி படைப்பாக்கப் பகுதி: பொதுத் தலைப்புகளில் கவிதை,கட்டுரை எழுதச்செய்தல்	04	சிறப்புத் தமிழ்மொழிப் பாடம் இரண்டாம் பருவம் 2024-2025
	Total	24	



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Notes

மொத்த - வினாத்தாள் அமைப்பு ഥ്രത്വെ-தேர்வு மதிப்பீட்டுத் அக மதிப்பெண்கள் - 50

	பக	தி –அ	
சரியான விடையைத் தேர்வு செ	ய்தல்	10×1=10)
	பகு	தி –ஆ	
கோடிட்ட இடங்களை நிரப்புக.	10x2	=20	
	பகு	தி –இ	
இரண்டு பக்க அளவில் விடைய	ளிக்க	2x10=20	

குறிப்பு:

- அனைத்து அலகுகளில் இருந்தும் வினாக்கள் அமைதல் வேண்டும் •
- வினாக்கள் இதுஅல்லது அதுஎன்ற அடிப்படையில் பகுதி இ–க்கான .
- அமைதல் வேண்டும்

1.	சிறப்புத் தமிழ் - 2024-2025 தொகுப்பு: தமிழ்த்துறை, டாக்டர்என்.ஜி.பி. கலை அறிவியல் கல்லூரி, கோயம்புத்தூர் –	
	641048.	
1.	பேராசிரியர் புலவர் சோம. இளவரசு,எட்டாம் பதிப்பு. 2014. தமிழ இலக்கிய வரலாறு – மணிவாசகர் பதிப்பகம்,சென்னை.	
2.	பாக்டர் மு.வாதராசன். 2010. நல்வாழ்வு, பாரி நிலையம், சென்னை.	
2	போதை பியர் மனைவர் பாக்கியமேரி,முகற் பதிப்பு.2013.	
5.	பேராசாராயர் புலைவர் பால்வாய சுரில் திறன்- பூவேந்தன் இலக்கணம் - இலக்கிய வரலாறு - மொழித்திறன்- பூவேந்தன் பதிப்பகம், சென்னை.	
	1. 1. 2. 3.	

E-Resources and Website	https://www.tamilvu.org

Learning Method	Lecture/ Tutorial / Student Seminar/GD/Assignment
Focus of the Course	Skill Development / Employability



	Semester – II AECC: HUMAN RIGHTS AND WOMEN'S RIGHTS						
Semester	Corse Code	Course Name	Category	L	Т	P	Credits
II	24CRU2AA	HUMAN RIGHTS AND WOMEN'S RIGHTS	AECC	24	-	-	2

	This course has been designed for students to learn and understand
Preamble	Concepts of Human Rights
	Human Rights Violation and Redressal Mechanism.
	Rights to Women and Child.
Prerequisite	Knowledge on Human and Women's Rights.

Course Or	utcomes (Cos)	
CO Number	Course Outcomes (COs) Statement	Bloom's Taxonomy Knowledge Level
CO1	Understand the basic concepts of Human Rights.	K2
CO2	Describe the Fundamental Rights.	K2
CO3	Relate Human Rights Violation and Redressal Mechanism.	K3
CO4	Infer the Rights of Women and Child.	K2
CO5	Apply Civil and Political Rights of Women.	K3

Aapping with Program Outcomes:						
Cos/POs	PO1	PO2	PO3	PO4	PO5	
CO1	~					
CO2						
CO3					and persons	
CO4						
CO5						



24CRU2AA

AECC: HUMAN RIGHTS AND WOMEN'S RIGHTS

Syllabus

TINIA	Content	Hrs	Resources
I	Introduction to Human Rights Meaning - Definition - Nature - Content - Legitimacy of Human Rights - Origin and Development of Human Rights - Theories - Principles of Magna Carta - Modern Movements of Human Rights - The Future of Human Rights.	4	Text Book
II	Human Rights in India The Constitution of India: Fundamental Rights - Right to Life and Liberty - Directive Principles of State Policy - Fundamental Duties - Individual and Group Rights - Other facets of Human Rights - Measures for Protection of Human Rights in India.	5	Text Book
III	Human Rights Violation and Redressal Mechanism Human Rights: Infringement of Human Right by State Machinery and by Individual - Remedies for State action and inaction - Constitutional Remedies - Public Interest Litigation (PIL) - Protection of Human Rights Act, 1993 - National Human Rights Commission - State Human Rights Commissions - Constitution of Human Right Courts.	5	Text Book
IV	Rights of Women and Child Matrimonial protection - Protection against dowry - Protection to pregnancy - Sexual offences - Law relating to work Place - Directive principles of Constitution (Article 39 a, d, e & Article 42, 43 & 46) - Trafficking of women - Constitutional Rights - Personal Laws - Protection of children against Sexual Offences Act, 2012 (POCSO). Case study: Sexual offences.	5	Text Book
v	Civil and Political Rights of Women Right of Inheritance - Right to live with decency and dignity - The Married Women's Property Act, 1874 - Women's right to property - Women Reservation Bill - National Commission for Women - Political participation - Pre-independent political participation of women - Participation of Women in post independent period. Kavalan App and Police Akka App.	5 1 5	Text Book
	Case study: Women's right to property	24	

Note: Case studies related to the above topics to be discussed (Examined Internal only)



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Text book	1.	Lalit Parmar, 1998, "Human Rights", Anmol Publications Pvt. Limited, New Delhi.				
-5	2. Krishna Pal Malik, 2009, "Women & Law ", Allahabad Law Univer New Delhi.					
Reference Books	Mandagadde Rama Jois, 2015, "Human Rights", Bharatiya Values, Bharatiya Vidya Bhavan Publications, Mumbai.					
	2.	Paras Diwan and Piyush Diwan, 1994, "Women and Legal Protection", South Asia Books, Andhra Pradesh.				
	3.	Venkataram and Sandhiya. N, 2001, "Research in Value Education", APH Publishing Corporation, New Delhi.				
	4.	Anand A. S, 2008, "Justice for Women: Concerns and Expressions", Universal Law Publishing Co., New Delhi.				

Journal and Magazines	Women and International Human Rights in Modern Times, Human Rights Law Review, Volume 24, Issue 2, June 2024.
U	https://doi.org/10.1093/hrlr/ngae007
E-Resources	Women's Rights as Human Rights,
and Website	https://www.ohchr.org/sites/default/files/Documents/Events/WHR
	D/WomenRightsAreHR.pdf

Learning Method	Chalk and Talk/Assignment/Seminar/ Group Discussion/Case Study
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Focus of the	Social	Awareness/	Environment	/ Gender	Sensitization	1
Course	ourse Constitutional Rights/ Human Values/ Ethics					

8.11.24 0

BoS Chairman/HoD Department of Biotechnology Dr. N. G. P. Arts and Science College Coimbatore – 641 048

	Dr.N.G.P. Arts and Science Co		
	APPROV	ED	
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