



VIVEKANANDHA



COLLEGE OF ENGINEERING FOR WOMEN

(An Autonomous Institution Affiliated to Anna University-Chennai)

Approved by AICTE – Accredited by NBA New Delhi and ISO 9001:2015 Certified)

Elayampalayam, Tiruchengode – 637 205, Namakkal District, Tamilnadu.

DEPARTMENT OF BIOTECHNOLOGY

CURRICULUM & SYLLABI

FOR

UG – B.TECH. BIOTECHNOLOGY

REGULATION 2023

(CBCS)



VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
[AUTONOMOUS]
Tiruchengode -637 205



Department of Biotechnology

Department Vision

To nourish the world of Technology & research with highly skilled women Biotechnologists to invent, innovate and disseminate the knowledge for the benefit of society & environment.

Department Mission

- To create excellent prospects for multifaceted bioengineering exercise and research in biotechnology.
- To produce tailored human resource to drive innovative biotechnological processes.
- To disseminate the knowledge in upcoming opportunities evolving sustainable entrepreneurship and research in the field of biotechnology for present and future.

Program Outcomes

PO1	Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO2	Problem analysis: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO3	Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO4	Conduct investigations of complex problems: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO5	Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.
PO6	The engineer and society: : Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO7	Environment and sustainability: Understand the impact of the professional



	engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO8	Ethics: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO9	Individual and team work: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	Communication: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

Program Educational Objectives

PEO1	The ability to provide the students with a solid foundation and the ability to apply mathematics, science in Biotechnology and to analyze data and technical concepts for application in Quality assurance and enabling placements/higher education .
PEO2	An ability to inculcate the professional and ethical attitudes, effective communication skills, team work skills, multidisciplinary approach among the students and an ability to relate environmental issues in broader social context .
PEO3	To provide with an excellent training to enhance the core profession career in the field of agriculture, pharmaceuticals, biochemical, food tech and other allied biosciences.

Program Specific Outcomes



PSO1	Demonstrate expertise in basic sciences and foundation courses.
PSO2	Demonstrate a working knowledge of advanced biological sciences
PSO3	Demonstrate competence in application of engineering principles to biological systems.

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai)Elayampalayam, Tiruchengode – 637 205								
Programme	B.Tech.	Programme Code	105	Regulation	2023				
Department	BIOTECHNOLOGY			Semester	I				
CURRICULUM (Applicable to the students admitted from the academic year 2023 - 2024 onwards)									
Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks		
			L	T	P		C	CA	ESE
THEORY									
U23MA101	Matrices and Calculus*	BSC	3	1	0	4	40	60	100
U23EN101	English For Communication*	HSMC	3	0	0	3	40	60	100
U23PH105	Engineering Physics#	BSC	3	0	0	3	40	60	100
U23CS101	Programming for Problem Solving*	ESC	3	0	0	3	40	60	100
U23TA101	தமிழர் மரபு / Heritage of Tamils#	HSMC	1	0	0	1	40	60	100
THEORY INTEGRATED WITH PRACTICAL									
U23GE101	Engineering Graphics*	ESC	2	0	3	3	50	50	100
PRACTICAL INTEGRATED WITH THEORY									
U23GE102	Design Thinking*	EEC	1	0	2	1	50	50	100
PRACTICAL									
U23PH102	Physics Laboratory\$	BSC	0	0	2	1	60	40	100
U23CS102	Programming for Problem Solving Laboratory*	ESC	0	0	2	1	60	40	100
MANDATORY COURSES									
-	Induction Programme*	3 Weeks				0	-	-	-
U23MCFY1	Environmental Science and Engineering\$	MC	2	0	0	0	100	-	100
Total						20	520	480	1000

BSC - Basic Science Courses, ESC- Engineering Science Courses, MC- Mandatory courses, HSMC- Humanities and Social Sciences including management courses, EEC- Employability Enhancement Courses, CA- Continuous Assessment, ESE - End Semester Examination.

*Common for all branches

\$Common for CSE, CST, IT & BT

	VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN (Autonomous Institution, Affiliated to Anna University, Chennai)Elayampalayam, Tiruchengode – 637 205									
Programme	B.Tech.	Programme Code	105	Regulation	2023					
Department	BIOTECHNOLOGY			Semester	II					
CURRICULUM (Applicable to the students admitted from the academic year 2023 - 2024 onwards)										
Course Code	Course Name	Category	Periods / Week			Credit	Maximum Marks			
			L	T	P		C	CA	ESE	Total
THEORY										
U23MA202	Complex Analysis and Ordinary Differential Equations*	BSC	3	2	0	4	40	60	100	
U23CH201	Engineering Chemistry ^{\$}	BSC	3	0	0	3	40	60	100	
U23EE201	Basic Electrical and Electronics Engineering [#]	ESC	3	0	0	3	40	60	100	
U23TA202	தமிழரும் தொழில்நுட்பமும்/ Tamils and Technology*	HSMC	1	0	0	1	40	60	100	
THEORY INTEGRATED WITH PRACTICAL										
U23CS203	Python Programming [@]	ESC	3	0	2	4	50	50	100	
U23EN204	Professional Communication*	HSMC	2	0	3	3	50	50	100	
PRACTICAL										
U23CH202	Chemistry Laboratory ^{\$}	BSC	0	0	2	1	60	40	100	
U23GE204	Engineering Practices Laboratory*	ESC	0	0	3	1	60	40	100	
MANDATORY COURSES										
U23MCFY2	Indian Constitution ^{\$}	MC	2	0	0	0	100	-	100	
Total						20	480	420	900	



BSC - Basic Science Courses, ESC- Engineering Science Courses, MC- Mandatory courses, HSMC- Humanities and Social Sciences including management courses, EEC- Employability Enhancement Courses, CA- Continuous Assessment, ESE - End Semester Examination.

*Common for all branches



#Common for EEE, ECE, BME & BT




@Common for EEE, ECE, BME & BT

^{\$}Common for CSE, CST, IT &

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Programme	B.Tech.	Programme Code	105	Regulation			2023			
Department	BIOTECHNOLOGY			Semester			III			
CURRICULUM (Applicable to the students admitted from the academic year 2023 - 2024 onwards)										
Course Code	Course Name		Hours / Week			Credit	Maximum Marks			
			L	T	P		C	CA	ESE	Total
THEORY										
U23MA303	Transforms and Partial Differential Equations	BSC	3	2	0	4	40	60	100	
U23BT302	Microbiology	PCC	4	0	0	3	40	60	100	
U23BT303	Cell biology	PCC	4	0	0	3	40	60	100	
U23GE304	Thermodynamics for Biotechnologist	ESC	4	0	0	3	40	60	100	
U23BT305	Biochemistry and Bioenergetics	PCC	3	0	3	3	50	50	100	
U23PT301	VQAR - 1	EEC	2	0	0	2	40	60	100	
PRACTICAL										
U23BT306	Cell & Microbiology Laboratory	PCC	0	0	3	1	60	40	100	
U23BT307	Biochemistry Laboratory	PCC	0	0	3	1	60	40	100	
Total Credits						20	370	430	800	

ESC- Engineering Science Courses, MC- Mandatory courses, EEC- Employability Enhancement Courses, PCC- Professional core courses, PEC- Professional Elective courses, OEC- Open Elective courses, CA- Continuous Assessment, ESE - End Semester Examination

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Programme	B.Tech.	Programme Code	105	Regulation			2023			
Department	BIOTECHNOLOGY			Semester			IV			
CURRICULUM (Applicable to the students admitted from the academic year 2023 - 2024 onwards)										
Course Code	Course Name		Hours / Week			Credit	Maximum Marks			
			L	T	P	C	CA	ESE	Total	
THEORY										
U23MA408	Probability and Statistics	BSC	4	1	0	4	40	60	100	
U23BT408	Bioprocess Engineering and Technology	PCC	4	0	0	3	40	60	100	
U23BT409	Molecular Biology	PCC	4	0	0	3	40	60	100	
U23BT410	Instrumentation Methods of Analysis	PCC	4	0	0	3	40	60	100	
	Additional Languages	EEC	2	0	0	2	40	60	100	
THEORY INTEGRATED WITH PRACTICAL										
U23BT411	Unit Operations	PCC	3	0	3	4	50	50	100	
PRACTICAL										
U23BT412	Bioprocess Laboratory	PCC	0	0	3	1	60	40	100	
U23BT413	Molecular biology Laboratory	PCC	0	0	3	1	60	40	100	
CAREER TRACK COURSES										
	Career Track Course - I	MC	2	0	0	1	40	60	100	
Total Credits						22	410	490	900	

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Programme	B.Tech	Programme Code	105	Regulation			2023		
Department	BIOTECHNOLOGY			Semester			V		
CURRICULUM (Applicable to the students admitted from the academic year 2023 - 2024 onwards)									
Course Code	Course Name		Hours / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U23BT514	Enzyme Engineering	PCC	4	0	0	3	40	60	100
U23BT515	Genetic Engineering	PCC	4	0	0	3	40	60	100
U23BT516	Heat and Mass Transfer Operations	PCC	4	0	0	3	40	60	100
	Professional Elective - I	PEC	4	0	0	3	40	60	100
	Open Elective - I	OEC	4	0	0	3	40	60	100
THEORY INTEGRATED WITH PRACTICAL									
U23BT517	Computational Biology	PCC	3	0	3	4	50	50	100
PRACTICAL									
U23BT518	Genetic Engineering Laboratory	PCC	0	0	3	1	60	40	100
U23BT519	Mini project –I	EEC	0	0	3	1	60	40	100
CAREER TRACK COURSES									
	Career Track Course - II	MC	2	0	0	1	40	60	100
Total Credits						22	410	490	900

PEC – Professional Elective Course







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Programme	B.Tech	Programme Code	105	Regulation				2023		
Department	BIOTECHNOLOGY			Semester				VI		
CURRICULUM										
(Applicable to the students admitted from the academic year 2023 - 2024 onwards)										
Course Code	Course Name		Hours / Week			Credit	Maximum Marks			
			L	T	P	C	CA	ESE	Total	
THEORY										
U23BT620	Biopharmaceutical Technology	PCC	4	0	0	3	40	60	100	
U23BT621	Plant and Animal Biotechnology	PCC	4	0	0	3	40	60	100	
U23BT622	Chemical Reaction Engineering	PCC	4	0	0	3	40	60	100	
	Professional Elective – II	PEC	4	0	0	3	40	60	100	
	Open Elective – II	OEC	4	0	0	3	40	60	100	
THEORY INTEGRATED WITH PRACTICAL										
U23BT623	Immunology	PCC	3	0	3	4	50	50	100	
PRACTICAL										
U23BT624	Plant and Animal Biotechnology Laboratory	PCC	0	0	3	1	60	40	100	
U23BT625	Mini project –II	EEC	0	0	3	1	60	40	100	
CAREER TRACK COURSES										
	Career Track Course - III	MC	2	0	0	1	40	60	100	
Total Credits						22	410	490	900	

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Programme	B.Tech	Programme Code	105	Regulation		2023			
Department	BIOTECHNOLOGY			Semester		VII			
CURRICULUM (Applicable to the students admitted from the academic year 2023 – 2024 onwards)									
Course Code	Course Name		Hours / Week			Credit	Maximum Marks		
			L	T	P	C	CA	ESE	Total
THEORY									
U23BT726	Downstream Processing	PCC	4	0	0	3	40	60	100
U23BT727	Proteomics & Genomics	PCC	4	0	3	3	40	60	100
	Professional Elective – III	PEC	4	0	0	3	40	60	100
	Professional Elective – IV	PEC	4	0	0	3	40	60	100
	Open Elective – III	OEC	4	0	0	3	40	60	100
THEORY INTEGRATED WITH PRACTICAL									
U23BT728	Principles of Food Processing	PCC	3	0	3	4	40	60	100
PRACTICAL									
U23BT729	Downstream Processing Laboratory	PCC	0	0	3	1	60	40	100
U23BT730	Project Phase - I	EEC	0	0	3	2	60	40	100
U23BT731	Internship Training and Summer Project	EEC	0	0	3	2	60	40	100
Total Credits						23	420	480	900

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Programme	B.Tech	Programme Code	105	Regulation		2023			
Department	BIOTECHNOLOGY			Semester		VIII			
CURRICULUM (Applicable to the students admitted from the academic year 2023 - 2024 onwards)									
Course Code	Course Name	Hours / Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
THEORY									
	Professional Elective – V	PEC	4	0	0	3	40	60	100
	Professional Elective – VI	PEC	4	0	0	3	40	60	100
PRACTICAL									
U23BT832	Project Phase - II	EEC	0	0	3	8	60	40	100
Total Credits						14	140	160	300

Cumulative Course Credit: 165

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637 205



Programme	B.Tech.	Programme Code	105	Regulation	2023			
Department	BIOTECHNOLOGY			Semester	-			
LIST OF OPEN ELECTIVES								
Course Code	Course Name	Hours / Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
OPEN ELECTIVE - I								
U23BTOE1	Biology for Engineers	3	0	0	3	50	50	100
U23BTOE2	Renewable Energy	3	0	0	3	50	50	100
U23BTOE3	Bio-Business	3	0	0	3	50	50	100
OPEN ELECTIVE –II								
U23BTOE4	Basics of Bioinformatics	3	0	0	3	50	50	100
U23BTOE5	Biosensors	3	0	0	3	50	50	100
U23BTOE6	Waste Management	3	0	0	3	50	50	100
OPEN ELECTIVE –III								
U23BTOE7	Food Processing and Preservation Technology	3	0	0	3	50	50	100
U23BTOE8	Forensic Technology	3	0	0	3	50	50	100
U23BTOE9	Bioethics & IPR	3	0	0	3	50	50	100

LIST OF MANDATORY COURSES

Course code	Course Name	Periods/Week			Credit C	Maximum Marks		
		L	T	P		CA	ESE	Total
U23MCFY1	Environmental Science and Engineering	3	0	0	0	100	-	100
U23MCFY2	Indian Constitution and Universal Human values	3	0	0	0	100	-	100
U23MCSY3	Numerical Ability	3	0	0	0	100	-	100
U23MCSY4	Verbal Ability	3	0	0	0	100	-	100
U23MCTY5	Logical Reasoning	3	0	0	0	100	-	100
U23MCTY6	Personality Development	3	0	0	0	100	-	100



Curriculum

Credit Distribution

S.No.	Course Components	Credits per semester								Total number of credits for each component
		I	II	III	IV	V	VI	VII	VIII	
1	Humanities and Social Sciences Courses (HSMC)	4	4	-	-	-	-	-	-	8
2	Basic Science Courses (BSC)	8	8	4	4	-	-	-	-	24
3	Engineering Science Courses (ESC)	7	9	3	-	-	-	-	-	19
4	Programme Core Courses (PCC)	-	-	12	15	14	14	10	-	65
5	Programme Elective Courses (PEC)	-	-	-	-	3	3	6	6	18
6	Open Elective Courses (OEC)	-	-	-	-	3	3	3	-	9
7	Employability Enhancing Courses (EEC)	1	-	2	2	1	1	4	8	19
8	Career Track Course (MC)	-	-	-	1	1	1	-	-	3
Total Credits										165

PROFESSIONAL ELECTIVE COURSES: VERTICALS

S.No.	Vertical I	Vertical II	Vertical III	Vertical IV	Vertical V	Vertical VI
	Environmental Biotechnology	Industrial Biotechnology	Clinical Biotechnology	Entrepreneurship	Bioprocess Technology	Computational Biotechnology
1	Environmental Biotechnology	Food Processing & Preservation Techniques	Stem cell technology	Total Quality management	Stoichiometry and Fluid Mechanics	Fundamentals of protein chemistry
2	Waste Water Treatment	Dairy Technology	Plant tissue culture & transformation techniques	Entrepreneurship & IPR	Mass transfer operations	Proteomics and Genomics
3	Bioremediation	Food & Dairy products and validation	Therapeutic applications of phytochemicals	Audit and Regulatory Compliance	Fermentation Technology	Perl Programming
4	Ecology & Environmental Management	Validation in Pharmaceutical Industries	Basics of human physiology and Anatomy	Biosafety and Hazard Management	Bioprocess technology	Molecular modeling
5	Solid Waste Management	Pharmaceutical Packaging Technology	Cancer Biology	Biobusiness	Bioreactor Design and Scale up process	Computer Aided Drug Design
6	Safety & Disaster Management	Recombinant products	Nanobiotechnology	Value added Biological products	Bioprocess Modelling and Simulation	Data mining and Machine Learning
7	Biodiversity	Biosimilars	Population and Molecular genetics	Product development and Technology transfer	Bioreactor Consideration for Recombinant Products	Biomaterials
8	Air Pollution and Control Engineering	Distillates and Fermentation technology	Tissue Engineering and Regenerative Medicine	Innovation and Design Thinking for Biotechnologists	Instrumentation and Process control	Physics and Chemistry of Materials
9	Energy Engineering and Technology	Food Quality, Safety Standards and Certification	Molecular Modeling and Drug design	Resource Management & Lean Start-up Management	Metabolic Engineering	Molecular Simulation of Biomolecules
10	Mini Project	Mini Project	Bioconjugate Technology and Applications	Mini Project	Mini Project	Mini Project

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Department	BIOTECHNOLOGY			Semester			-		
CURRICULUM (Applicable to the students admitted from the academic year 2023 - 2024 onwards)									
LIST OF VERTICALS									
Course Code	Course Name	Hours / Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
Vertical - I Environmental Biotechnology									
U23BTV11	Environmental Biotechnology	3	0	0	3	40	60	100	
U23BTV12	Waste Water Treatment	3	0	0	3	40	60	100	
U23BTV13	Bioremediation	3	0	0	3	40	60	100	
U23BTV14	Ecology & Environmental Management	3	0	0	3	40	60	100	
U23BTV15	Solid Waste Management	3	0	0	3	40	60	100	
U23BTV16	Safety & Disaster Management	3	0	0	3	40	60	100	
U23BTV17	Biodiversity	3	0	0	3	40	60	100	
U23BTV18	Air Pollution and Control Engineering	3	0	0	3	40	60	100	
U23BTV19	Energy Engineering and Technology	3	0	0	3	40	60	100	
U23BTV10	Mini Project	3	0	0	3	40	60	100	
Vertical - II Industrial Biotechnology									
U23BTV21	Food Processing & Preservation Techniques	3	0	0	3	40	60	100	
U23BTV22	Dairy Technology	3	0	0	3	40	60	100	
U23BTV23	Food & Dairy products and validation	3	0	0	3	40	60	100	
U23BTV24	Validation in Pharmaceutical Industries	3	0	0	3	40	60	100	
U23BTV25	Pharmaceutical Packaging Technology	3	0	0	3	40	60	100	
U23BTV26	Recombinant products	3	0	0	3	40	60	100	
U23BTV27	Biosimilars	3	0	0	3	40	60	100	
U23BTV28	Distillates and Fermentation technology	3	0	0	3	40	60	100	
U23BTV29	Food Quality, Safety Standards and Certification	3	0	0	3	40	60	100	
U23BTV20	Mini Project	3	0	0	3	40	60	100	
Vertical - III Clinical Biotechnology									
U23BTV31	Stem cell technology	3	0	0	3	40	60	100	
U23BTV32	Plant tissue culture & transformation techniques	3	0	0	3	40	60	100	

U23BTV33	Therapeutic applications of phytochemicals	3	0	0	3	40	60	100
U23BTV34	Basics of human physiology and Anatomy	3	0	0	3	40	60	100
U23BTV35	Cancer Biology	3	0	0	3	40	60	100
U23BTV36	Nanobiotechnology	3	0	0	3	40	60	100
U23BTV37	Population and Molecular genetics	3	0	0	3	40	60	100
U23BTV38	Tissue Engineering and Regenerative Medicine	3	0	0	3	40	60	100
U23BTV39	Molecular Modeling and Drug design	3	0	0	3	40	60	100
U23BTV30	Bioconjugate Technology and Applications	3	0	0	3	40	60	100
Vertical - IV Entrepreneurship								
U23BTV41	Total Quality management	3	0	0	3	40	60	100
U23BTV42	Entrepreneurship & IPR	3	0	0	3	40	60	100
U23BTV43	Audit and Regulatory Compliance	3	0	0	3	40	60	100
U23BTV44	Biosafety and Hazard Management	3	0	0	3	40	60	100
U23BTV45	Bio business	3	0	0	3	40	60	100
U23BTV46	Value added Biological products	3	0	0	3	40	60	100
U23BTV47	Product development and Technology transfer	3	0	0	3	40	60	100
U23BTV48	Innovation and Design Thinking for Biotechnologists	3	0	0	3	40	60	100
U23BTV49	Resource Management & Lean Start-up Management	3	0	0	3	40	60	100
U23BTV40	Mini Project	3	0	0	3	40	60	100
Vertical - V Bioprocess Technology								
U23BTV51	Stoichiometry and Fluid Mechanics	3	0	0	3	40	60	100
U23BTV52	Mass transfer operations	3	0	0	3	40	60	100
U23BTV53	Fermentation Technology	3	0	0	3	40	60	100
U23BTV54	Bioprocess technology	3	0	0	3	40	60	100
U23BTV55	Bioreactor Design and Scale up process	3	0	0	3	40	60	100
U23BTV56	Bioprocess Modelling and Simulation	3	0	0	3	40	60	100
U23BTV57	Bioreactor Consideration for Recombinant Products	3	0	0	3	40	60	100
U23BTV58	Instrumentation and Process control	3	0	0	3	40	60	100
U23BTV59	Metabolic Engineering	3	0	0	3	40	60	100
U23BTV50	Mini Project	3	0	0	3	40	60	100
Vertical - VI Computational Biotechnology								
U23BTV51	Fundamentals of protein chemistry	3	0	0	3	40	60	100
U23BTV52	Proteomics and Genomics	3	0	0	3	40	60	100
U23BTV53	Perl Programming	3	0	0	3	40	60	100

U23BTV54	Molecular modeling	3	0	0	3	40	60	100
U23BTV55	Computer Aided Drug Design	3	0	0	3	40	60	100
U23BTV56	Data mining and Machine Learning	3	0	0	3	40	60	100
U23BTV57	Biomaterials	3	0	0	3	40	60	100
U23BTV58	Physics and Chemistry of Materials	3	0	0	3	40	60	100
U23BTV59	Molecular Simulation of Biomolecules	3	0	0	3	40	60	100
U23BTV50	Mini Project	3	0	0	3	40	60	100

CA - Continuous Assessment, ESE - End Semester Examination



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Elayampalayam, Tiruchengode – 637 205



Programme	B.E./B.Tech	Programme Code	105	Regulation	2023										
Department	BIOTECHNOLOGY			Semester	I										
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks									
		L	T	P	C	CA	ESE	Total							
U23MA101	Matrices and Calculus	3	1	0	4	40	60	100							
Course Objective	The Main Objective of the course is to														
	<ul style="list-style-type: none"> To develop the use of matrix algebra techniques that is needed by engineers for practical applications. To familiarize the students with differential calculus. To familiarize the student with functions of several variables. This is needed in many branches of engineering. To make the students understand various techniques of integration. To acquaint the student with mathematical tools needed in evaluating multiple integrals and their applications. 														
	At the end of the course the students will be able to						Knowledge level								
	CO1: Use the matrix algebra methods for solving practical problems.						K1,K3								
	CO2: Apply differential calculus tools in solving various application problems.						K2,K4								
CO3: Able to use differential calculus ideas on several variable functions.						K3,K5									
CO4: Apply different methods of integration in solving practical problems.						K2,K5									
CO5: Apply multiple integral ideas in solving areas, volumes and other practical problems.						K3,K5									
Pre-requisites	-														
CO / PO Mapping													CO/PSO Mapping		
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2		1	1								2		
CO 2	3	3	2		1								2		
CO 3	3		2	1									2		
CO 4	3	2	2	1	1								2		
CO 5	3		1	1	1								2		
Course Assessment Methods															
Direct															
<ol style="list-style-type: none"> Continuous Assessment Test I, II & III Assignment. End-Semester examinations 															
Indirect															
<ol style="list-style-type: none"> Course - end survey 															
Content of the syllabus															

Unit – I	MATRICES	Periods	12
Characteristic equation – Eigen values and Eigenvectors of a real matrix– Properties of Eigen values and Eigenvectors – Cayley-Hamilton theorem (excluding proof) – Diagonalization of matrices – Reduction of a quadratic form to canonical form by orthogonal transformation – Nature of quadratic forms. Simple application in encoding message using 2×2 matrix.			
Unit - II	DIFFERENTIAL CALCULUS	Periods	12
Limit, Continuity, Differentiability, Rules of differentiation, Differentiation of various functions, Rolle’s theorem (excluding proof), Mean value theorem (excluding proof), Taylor’s theorem(excluding proof), Maxima and Minima. Applications: Newton’s law of cooling – Heat flow problems.			
Unit – III	FUNCTIONS OF SEVERAL VARIABLES	Periods	12
Partial differentiation – Homogeneous functions and Euler’s theorem (excluding proof) – Total derivative – Change of variables – Jacobians – Partial differentiation of implicit functions – Taylor’s series for functions of two variables (excluding proof) – Maxima and minima of functions of two variables. Applications: Lagrange’s method of undetermined multipliers.			
Unit - IV	INTEGRAL CALCULUS	Periods	12
Definite and Indefinite Integrals- Methods of integration: Integration by parts, Trigonometric integrals, Trigonometric substitutions, Integration of rational functions by partial fraction, Integration of irrational functions -Reduction formula on $\int_0^{\frac{\pi}{2}} \cos^n x dx$, $\int_0^{\frac{\pi}{2}} \sin^n x dx$.			
Unit - V	MUTIPLE INTEGRALS	Periods	12
Double integrals – Change of order of integration – Double integrals in polar coordinates – Area enclosed by plane curves – Triple integrals – Volume of solids – Change of variables in double and triple integrals.			
Total Periods			60
Text Books			
1.	Stewart, J. Calculus: Early Transcendentals (8 th Edition), Cengage Learning, 2015.		
2.	Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.		
References			
1.	Reyszig E, Advanced Engineering Mathematics (10 th Edition), John Wiley (2015).		
2.	Ali. N., Goyal. M. and Watkins. C., “Advanced Engineering Mathematics”, Firewall Media (An imprint of Lakshmi Publications Pvt., Ltd.), New Delhi, 7th Edition, 2009.		
3.	Thomas. G. B., Hass. J, and Weir. M.D, “Thomas Calculus “, 14th Edition, Pearson India, 2018.		
4.	Anton H, Calculus: Early Transcendentals, 10th Edition, Wiley (2016).		
5.	B V Ramana, Higher Engineering Mathematics, Tata McGraw Hill Education Pvt Ltd., New Delhi (2016)		
Resources			
1.	https://freevideolectures.com > All Courses > Calculus > UCLA		
2.	www.learnerstv.com/Free-engineering-Video-lectures		
3.	www.nptel.ac.in		



VIVEKANANDHA
COLLEGE OF ENGINEERING FOR WOMEN
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Programme	B.E/B.TECH	Programme code	105	Regulation	2023			
Department	BIO TECHNOLOGY			Semester	I			
Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U23EN101	English for Communication	3	0	0	3	40	60	100
Objective	The main objective of this course is to: <ul style="list-style-type: none"> • Improve the communicative ability of learners. • Make learners read widely in order to practice writing • Make learners develop vocabulary and strengthen grammatical understanding • Assist students in the development of intellectual flexibility, creativity, and cultural literacy so that they may engage in life-long learning. • Identify and begin to apply the language features of academic and professional writing and speaking 							
Outcomes	The students who complete this course successfully are expected to:					Knowledge Level		
	CO1: Use appropriate vocabulary in a professional context					K1		
	CO2: Write appropriately based on the knowledge gained through reading of a variety of materials					K1		
	CO3: Use language through their grammatical acquisition					K2		
	CO4: Read and infer meanings of technical texts					K2		
CO5: Comprehend and retain the contextual and syntax understanding from reading.					K3			
Pre-Requisites								

CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1– Weak													CO/PSO Mapping		
COs	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO 1						2			3	3		3		2	
CO 2						2			3	3		3		2	
CO 3						2			3	3		3		2	
CO 4						2			3	3		3		2	
CO 5						2			3	3		3		2	

Course Assessment Methods			
Direct			
4. Continuous Assessment Test I, II & III			
5. Assignments			
6. End-Semester examinations			
Indirect			
2. Course - end survey			
Content of the syllabus			
Unit - I		Periods	9
<p>Listening-Introduction to Different Types of Listening, Listening to Casual Conversations, Speaking-Introduction to develop the Art of Speaking, Giving Self Introduction, Reading–Understanding the Basics of Reading Skills, Reading Instructions and Technical Manuals, Writing- Introduction to writing strategies, Writing Definitions, Focus on Language - -Technical terms (Jargon), Word Formation with Prefixes and Suffixes, Using Active Voice and Passive Voice, Basic sentence patterns, Tenses (past, present, perfect and continuous tenses).</p>			
Unit - II		Periods	9
<p>Listening- Listening to lectures, listening to description of equipment, Speaking- Strategies for Developing Conversational Skills, Short Conversations through Role Play Activities, Reading– Reading Comprehension, Reading e-mails, Reading Headlines, Predicting the Content, Writing- Note making, Writing Descriptions, Focus on Language–Collocations, One word substitution, Subject - verb agreement</p>			
Unit - III		Periods	9
<p>Listening- Listening to different kinds of interviews (Face - to - face, radio, TV and telephone interviews), Speaking- Describing an Object, Asking Questions, participating in Discussions Reading– Intensive reading, Reading passages for gist. Writing- Writing short& lengthy e-mails with emphasis on Brevity, Clarity, Coherence and Cohesion), Focus on Language–Sequential Connectives, Impersonal Passive</p>			
Unit - IV		Periods	9
<p>Listening-Note Taking, Speaking- Improving Fluency through Narration. Reading–Reading passages for specific information- Phone messages, Reading and Transferring Information. Writing- Effective writing strategies, Writing a Memo, Focus on Language– Cause and Effect, Conditional Statements (if - clauses and types), Usage of Modal Verbs.</p>			
Unit - V		Periods	9
<p>Listening- Listening to understand Modulation, listening to Welcome Speeches, Speaking- Delivering Welcome Address, Understanding Segmental and Supra Segmental Features-Practicing Stress, Pause and Intonation, Reading– Reading for a purpose, Reading Business Documents, Interpreting Charts and Graphs, Writing- Describing a Process. Focus on Language -Synonyms and Antonyms, Common Errors in English.</p>			
		Total Periods	45
Text Books:			
1.	Sumant. s, Pereira Joyce, Shameem.M, Selvarajan.R-English Communication Skills,Vijay Nicole imprints Pvt.Ltd, 2015.		

2.	Sokkaalingam, S.R.M., The Art Of Speaking English Versatile Publishing House, 2018.
References:	
1.	Dr. Padma Ravindran, Poorvadevi, M. Y. Abdur Razack- English for life, English for work, students Book, Ebek language laboratory pvt ltd, 2011.
2.	Dutt Rajeevan, Prakash. A Course in Communication Skill (Anna University, Coimbatore edition): Cambridge University Press India Pvt.Ltd, 2007.
3.	S.P. Dhanavel, English and Communication Skills for Students of Science and Engineering, Orient Blackswan Pvt, Ltd, 2009.
4.	Technical English – I & II, Sonaversity, Sona College of Technology, Salem, First Edition, 2012.
5.	Meenakshmi Raman and Sangeeta Sharma- 'Technical communication English Skills for Engineers; oxford University Press, 2008.
E-Resources.	
1.	http://www.sparknotes.com/lit/the-alchemist/summary.html
2.	https://www.stephencovey.com/7habits/7habits.php
3.	http://en.wikipedia.org/wiki/The_Seven_Habits_of_Highly_Effective_People



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Programme	B.Tech.	Programme Code	105	Regulation	2023				
Department	Biotechnology			Semester	I				
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks			
		L	T	P	C	CA	ESE	Total	
U23PH101	ENGINEERING PHYSICS	3	0	0	3	40	60	100	
Course Objective	<p>The student should be made to,</p> <ul style="list-style-type: none"> understand the basic concepts of properties of matter gain knowledge about the conduction properties of metals identify the different types of crystal structures and crystal growth techniques. Study the production and applications of ultrasonics. correlate better understanding the carrier concentration and its variations with temperature in a semiconductor. Study the properties of modern engineering materials and its uses categorize the types of laser and fiber optics 								
Course Outcome	At the end of the course, the student will be able to						Knowledge Level		
	<ul style="list-style-type: none"> understand the elastic properties of the materials 						K2		
	<ul style="list-style-type: none"> gain knowledge about the conduction properties of metals 						K3		
	<ul style="list-style-type: none"> determine packing factor for various unit cells and understand different types of crystal imperfections and learn the engineering, medical applications. 						K1		
	<ul style="list-style-type: none"> discuss the basic idea of semiconducting materials and realize the function of modern engineering materials 						K1		
<ul style="list-style-type: none"> learn the optical properties of materials and its uses 						K3			
Pre-requisites	---								



COs	CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak												CO/PSO Mapping		
	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1	3	2	3	1	2									2	
CO 2	3	2	3	3	1										
CO 3	3	3		3	1									2	
CO 4	3		2	1	1							3	2		
CO 5	3			1	2	2							2		

Course Assessment Methods

Direct
<ol style="list-style-type: none"> Continuous Assessment Test I, II & III Assignments and Mind map End-Semester examinations
Indirect

Course - end survey			
Content of the syllabus			
Unit – I	PROPERTIES OF MATTER	Periods	9
<p>Elasticity: Types of moduli of elasticity - Stress - Strain Diagram – uses. Young’s modulus: Uniform bending (qualitative) Experimental determination by non-uniform bending - Twisting couple on a wire – Application: Torsional pendulum.</p> <p>Viscosity: Co-efficient of viscosity - Poiseuilles' formula - Experimental determination – uses.</p>			
Unit - II	ELECTRICAL PROPERTIES OF METALS	Periods	9
<p>Classical theory: Classical free electron theory of metals- Expressions for electrical conductivity and Thermal Conductivity of metals – Wiedemann-Franz law (Qualitative) - Success and failures.</p> <p>Quantum theory: de Broglie’s hypothesis - Schrodinger’s time independent and time dependent wave equations (Qualitative) - Particle in a one-dimensional box - Fermi – Dirac Statistics - Density of energy states (Qualitative).</p>			
Unit – III	CRYSTAL PHYSICS AND ULTRASONICS	Periods	9
<p>Crystallography - Unit cell - Crystal systems - Bravais lattices- Lattice planes - Miller indices - Inter-planar spacing in cubic lattice- Calculation of number of atoms per unit cell- Atomic radius – Coordination number- Packing Factor for HCP structures.</p> <p>Ultrasonics: Introduction - Properties and Generation of Ultrasonics – Magnetostriction and Piezoelectric Oscillator methods – Applications: Sound Navigation and Ranging (SONAR), Non – Destructive Testing (NDT) and Sonogram.</p>			
Unit - IV	SEMICONDUCTING & MODERN ENGINEERING MATERIALS	Periods	9
<p>Semiconductors: Elemental and Compound semiconductors - Intrinsic semiconductor: (Qualitative only) – Carrier concentration – Fermi level – Electrical conductivity - Band gap determination. Extrinsic semiconductors: Carrier concentration in n – type and p – type semiconductor (Qualitative) – Variation of Fermi level with temperature. Application; Construction and working of LED.</p> <p>Metallic glasses: preparation, properties and applications - Shape memory alloys (SMA): Characteristics and applications of NiTi alloy.</p>			
Unit – V	LASER AND FIBER OPTICS	Periods	9
<p>Laser: Interactions of Radiations with matters - Characteristics of laser – Derivation of Einstein’s A and B coefficients. Types: CO2 laser - Semiconductor laser: Homo junction - Applications.</p> <p>Optical fiber: Principle of propagation of light through optical fiber - Numerical aperture and acceptance angle (Qualitative) -Types of optical fibers -Fiber optical communication system (block diagram) - Application: Temperature sensor.</p>			
Total Periods			45
Text Books			
1.	R.K. Gaur and Gupta. S.L, Engineering Physics, Dhanpat Rai Publishers, 2017.		
2.	D Pillai., Solid state physics, New Age International Private Limited.		
3.	P.Mani, “Engineering Physics”, Shri Dhanam publisher, Chennai – 600 042		
References			
1.	B.K. Pandey, S. Chaturvedi. “Engineering Physics”, 1 st Edition, Cengage Learning India Pvt Ltd,		

	(2012).
2.	Fundamentals Of Physics Extended 8/Ed 8th Edition, David Halliday, Robert ResnickJearl Walker, Wiley India Pvt Ltd, 2008.
3.	Lawrence H.Vanvlack, "Elements of materials Science Engineering, 6 th Edition, Pearson Publication.
4.	S.O.Pillai, "Solid State Physics", New Age International Publishers
5.	Dr.V.Rajendran, "Engineering Physics", Tata McGraw Hill Education Private Limited, New Delhi
Resources	
1.	w.e-books directory.com
2.	me.iitk.ac.in
3.	ysics.cu.ac.bd/

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Programme	B.E./B.Tech.	Programme Code			Regulation		2023								
Department	CSE, EEE, ECE, IT, BT, CST & BME				Semester		I								
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks									
		L	T	P	C	CA	ESE	Total							
U23CS101	Programming for Problem Solving	3	0	0	3	40	60	100							
Course Objective	The main objective of this course is to: <ul style="list-style-type: none"> • Learn the fundamentals of computers, languages, number systems and acquire problem solving skills in C Programming 														
Course Outcome	At the end of the course, the student should be able to,							Knowledge Level							
	CO1: Examine number systems and to apply problem solving techniques							K3							
	CO2: Learn the basics of C programming with branching and looping statements							K2							
	CO3: Experiment the C programs using Arrays and Pointers for simple applications							K3							
	CO4: Solve C programs with the Functions and Strings							K3							
	CO5: Apply Structures, Union and File concepts to solve simple real world problems							K3							
CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													CO/PSO Mapping		
COs	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	
CO 1	3	2	1	1	2							2	3	3	
CO 2	2	1	1		2							2	2	2	
CO 3	3	2	1	1	2							2	3	3	
CO 4	3	2	1	1	2							2	3	3	
CO 5	3	2	1	1	2							2	3	3	
Course Assessment Methods															
Direct															
1. Continuous Assessment Test I, II & III															
2. Assignment / Quiz / Seminar															
3. End-Semester examination															
Indirect															
1. Course - end survey															
Content of the syllabus															
Unit – I	INTRODUCTION TO PROBLEM SOLVING							Periods	9						

Basic organization of Computer - Programming languages - Compilers – Interpreter - Flowchart – Pseudocode – Algorithm. Number Systems – Decimal, Binary, Octal and Hexadecimal conversions			
Unit - II	BASICS OF C PROGRAMMING	Periods	9
Introduction to C – Features - Data Types – Constants – Variables - I/O Statement - Operators –Expressions - Decision Making and Branching – Looping Statements - Break, Go to, Continue.			
Unit – III	ARRAYS AND POINTERS	Periods	9
Arrays: Concepts – Need – one dimensional array – array declaration – features – array initialization - Two-Dimensional Arrays- Multidimensional Arrays. Pointers: Introduction, pointer declaration-accessing variable through pointer- Pointers and Arrays, Pointers and strings – Pointers structures - Pointer Arithmetic - Array of Pointers – dynamic memory allocation - malloc, realloc, free.			
Unit - IV	FUNCTIONS AND STRINGS	Periods	9
Functions: Introduction, function declaration, defining and accessing functions, User-defined Functions-storage classes-function prototypes-parameter passing methods-recursion. Strings: Concepts – Strings manipulation - String Input / Output Functions- Strings standard functions - Arrays of Strings.			
Unit – V	STRUCTURES, UNIONS AND FILE SYSTEMS	Periods	9
Structures: Introduction- nested structures- Arrays of Structures - Structures and Functions - Pointers to Structures – Unions. File: opening, defining, closing, File Modes, File Types , Writing contents into a file, Reading file contents, Appending an existing file, File permissions and rights, Changing permissions and rights.			
Total Periods			45
Text Books			
1.	S.Kuppuswami, S.Maliga, C. S. Kanimozhi and K.Kousalya, “Problem Solving and Programming”, Tata McGraw Hill, 2019.		
2.	E. Balagurusamy, “Programming in ANSI C”, 8 th Edition, Mc Graw Hill, 2019.		
References			
1.	Herbert Schildt, C: The Complete Reference, Mc Graw Hill, 4th Edition, 2017		
2.	Kernighan BW and Ritchie DM, “The C Programming Language”, 2 nd Edition, Prentice Hall of India, 2017.		
3.	Dr.V.Rameshbabu, Dr.R.Samyutha, M.Muni Rathnan, “Computer Programming”, VRB Publishers Pvt.Ltd, 2016.		
Tools Required			
	Codetandra/HackerRank/ HackerEarth / Any online Problem Solving Platforms		
Resources			
1.	https://www.geeksforgeeks.org/c-language-set-1-introduction/		
2.	https://www.programiz.com/c-programming		
3.	https://www.cprogramming.com/		



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Programme	B.Tech.	Programme code	105	Regulation	2023			
Department	BIO TECHNOLOGY			Semester	I			
Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U23TN101	தமிழர்மரபு Heritage of Tamils	1	0	0	1	40	60	100
Content of the syllabus								
அலகு 1	மொழி மற்றும் இலக்கியம்				Periods	3		
இந்தியமொழிக் குடும்பங்கள் - திராவிடமொழிகள் - தமிழ் ஒருசெம்மொழி-தமிழ் செவ்விலக்கியங்கள் - சங்க இலக்கியத்தின் சமயச் சார்பற்றதன்மை-சங்க இலக்கியத்தில் பகிரதல் அறம் திருக்குறளில் மேலாண்மைக் கருத்துக்கள் தமிழ்க் காப்பியங்கள் தமிழகத்தில் சமணபௌத்தசமயங்களின் தாக்கம் - பக்தி இலக்கியம்,ஆழ்வார்கள் மற்றும் நாயன்மார்கள் - சிற்றிலக்கியங்கள் - தமிழில் நவீன இலக்கியத்தின் வளர்ச்சி - தமிழ் இலக்கியவளர்ச்சியில் பாரதியார் மற்றும் பாரதிதாசன் ஆகியோரின் பங்களிப்பு.								
அலகு 2	மரபு-பாறைஓவியங்கள் முதல் நவீனஓவியங்கள் வரை- சிற்பக் கலை				Periods	3		
நடுகல் முதல் நவீனசிற்பங்கள் வரை-ஐம்பொன் சிலைகள் பழங்குடியினர் மற்றும் அவர்கள் தயாரிக்கும் கைவினைப் பொருட்கள்,பொம்மைகள் - தேர் செய்யும் கலை - சுடுமண் சிற்பங்கள் - நாட்டுப்புறத் தெய்வங்கள் - குமரிமுனையில் திருவள்ளூர் சிலை - இசைக் கருவிகள் - மிருதங்கம்,பறை,வீணை. யாழ்,நாதஸ்வரம் - தமிழர்களின் சமூகபொருளாதாரவாழ்வில் கோவல்களின் பங்கு.								
அலகு 3	நாட்டுப்புறக் கலைகள் மற்றும் வீரவிளையாட்டுகள்:				Periods	3		
தெருக்கூத்து,கரகாட்டம்,வில்லுப்பாட்டு,கணியான் கூத்து,ஒயிலாட்டம்,தோல்பாவைக்கூத்து,சிலம்பாட்டம்,வளரி,புலியாட்டம்,தமிழர்களின் விளையாட்டுகள்.								
அலகு 4	தமிழர்களின் திணைக் கோட்பாடுகள்:				Periods	3		
தமிழகத்தின் தாவரங்களும்,விலங்குகளும் - தொல்காப்பியம் மற்றும் சங்க இலக்கியத்தில் அகம் மற்றும் புறக் கோட்பாடுகள் - தமிழர்கள் போற்றியஅறக்கோட்பாடு - சங்ககாலத்தில் தமிழகத்தில் எழுத்தறிவும்,கல்வியும் - சங்ககாலநகரங்களும் துறைமுகங்களும் - சங்ககாலத்தில் ஏற்றுமதிமற்றும் இறக்குமதி-கடல்கடந்தநாடுகளில் சோழர்களின் வெற்றி.								
அலகு 5	இந்தியதேசிய இயக்கம் மற்றும் இந்தியப்பண்பாட்டிற்குத் தமிழர்களின் பங்களிப்பு:				Periods	3		
இந்தியவிடுதலைப்போரில் தமிழர்களின் பங்கு - இந்தியாவின் பிறப்பகுதிகளில் தமிழ்ப் பண்பாட்டின் தாக்கம் - சுயமரியாதை இயக்கம் - இந்தியமருத்துவத்தில்,சித்தமருத்துவத்தின் பங்கு-கல்வெட்டுகள்,கையெழுத்துப்படிக்கல்கள் - தமிழ்ப் புத்தகங்களின் அச்சுவரலாறு.								
					Total Periods	15		



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Programme	B.Tech.	Programme code	105	Regulation	2023			
Department	BIO TECHNOLOGY			Semester	I			
Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U23TN101	தமிழர்மரபு Heritage of Tamils	1	0	0	1	40	60	100
Content of the syllabus								
UNIT I	LANGUAGE AND LITERATURE				Periods	3		
Language Families in India-Dravidian Languages–Tamil as a Classical Language – Classical Literature in Tamil–Secular Nature of Sangam Literature–Distributive Justice in Sangam Literature – Management Principles in Thirukural – Tamil Epics and Impact of Buddhism & Jainism in Tamil Land – Bakthi Literature Azhwars and Nayanmars – Forms of minor Poetry – Development of Modern literature in Tamil –Contribution of Bharathiyar and Bharathidhasan.								
UNIT II	HERITAGE – ROCK ART PAINTINGS TO MODERN ART–SCULPTURE				Periods	3		
Hero stone to modern sculpture – Bronze icons –Tribes and their handicrafts –Art of temple car making – Massive Terracotta sculptures Village deities, Thiruvalluvar Statue at Kanyakumari, Making of musical instruments - Mridhangam, Parai Veenai, Yazh and Nadhaswaram- Role of Temples in Social and Economic Life of Tamils .								
UNIT III	FOLK AND MARTIAL ARTS				Periods	3		
Therukoothu, Karagattam, Villu Pattu, Kaniyan Koothu, Oyillattam, Leather puppetry, Silambattam, Valari, Tigerdance – Sports and Games of Tamils.								
UNIT IV	THINAI CONCEPT OF TAMILS				Periods	3		
Flora and Fauna of Tamils & Aham and Puram Concept from Tholkappiyam and Sangam Literature-Aram Concept of Tamils – Education and Literacy during Sangam Age – Ancient Cities and Ports of Sangam Age – Export and Import during Sangam Age – Overseas Conquest of Cholas.								
UNIT V	CONTRIBUTION OF TAMILS TO INDIAN NATIONAL MOVEMENT AND INDIAN CULTURE				Periods	3		
Contribution of Tamils to Indian Freedom Struggle- The Cultural Influence of Tamils over the other parts of India– Self –Respect Movement –Role of Siddha Medicine in Indigenous Systems of Medicine — Inscriptions & Manuscripts —Print History of Tamil Books.								
TEXT-CUM-REFERENCE BOOKS								

1 | தமிழகவரலாறும் – மக்களும் பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு:

	தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள்கழகம்).
2	கணிணித்தமிழ் - முனைவர் இல. சுந்தரம். (விகடன்பிரசுரம்).
3	கீழடி - வைகை நதிக்கரையில் சங்க நகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4	பொருறை - ஆற்றங்கரைநாகரிகம். (தொல்லியல்வெளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL - (in print)
6	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies)
7	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Published by: The Author)
11	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) - Reference Book.



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Programme	B.Tech	Programme Code	105	Regulation	2023			
Department	Biotechnology			Semester	I			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U23GE101	Engineering Graphics	2	0	3	3	50	50	100

Course Objective	The main objective of this course is to:							
	<ul style="list-style-type: none"> Develop skills to enhance their ability to know the concept of engineering graphics and to draw the points kept in various positions, lines and planes. Project the drawing of various solids. Sketch sectioned views of solids. Draw the development of surfaces. Draw the isometric and orthographic projections for any given object to the required standard. 							

Course Outcomes	At the end of the course, the student should be able to	Knowledge Level
	CO1: Construct plane curves and develop projection of points , lines and plane surfaces	K2
	CO2: Construct projection of solids with various conditions.	K4
	CO3: Design the section of solids and analyze the true shape of the section	K3
	CO4: Design and develop the different solid surfaces.	K2
	CO5: Construct isometric and orthographic projection of different solids.	K1



Pre - requisites	Nil
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CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													CO/PSO Mapping		
COs	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO	3	3	3	3	3	-	-	-	-	-	-	-	2	-	-
CO	3	3	2	2	2	-	-	-	-	-	-	-	2	-	-
CO	3	2	2	2	3	-	-	-	-	-	-	-	2	2	-
CO	3	2	3	3	2	-	-	-	-	-	-	-	2	-	-
CO	3	3	2	3	3	-	-	-	-	-	-	-	2	2	-



Course Assessment Methods	
Direct	
1. Continuous Assessment Test I, II & III	
2. Assignment	
3. End-Semester examination	
Indirect	
1. Course - end survey	

Content of the Syllabus

Concepts & Conventions (Not for Examination)	Importance of graphics in engineering applications – Use of drafting instruments – BIS conventions and specifications – Size, layout and folding of drawing sheets – Lettering and dimensioning.	Periods	1
Unit – I	PROJECTION OF POINTS, LINES AND PLANE SURFACES	Periods	3+8
Introduction to Plane curves, Orthographic projection – principles – projection of points, straight lines (only first angle projections) and plane surfaces (polygonal and circular).			
Unit - II	PROJECTION OF SOLIDS	Periods	3+8
Projections of simple solids like prisms, pyramids, cylinder and cone when the axis is inclined to one reference plane.			
Unit - III	SECTION OF SOLIDS	Periods	3+8
Sectioning of solids - prisms, pyramids, cylinder and cone in simple vertical position by cutting planes inclined to one reference plane and perpendicular to the other - Obtaining true shape of section.			
Unit - IV	DEVELOPMENT OF SURFACES	Periods	3+8
Development of lateral surfaces of simple solids like prisms, pyramids, cylinders and cones – development of simple truncated solids involving prisms, pyramids, cylinders and cones.			
Unit - V	ISOMETRIC PROJECTIONS, ORTHOGRAPHIC VIEWS FROM PICTORIAL VIEWS	Periods	5+10
Isometric Projection and Introduction to AutoCAD / Solid Edge: Principles of isometric projection - Isometric scale -Isometric projections of simple solids like prisms, pyramids, cylinders and cones & orthographic views from pictorial views.			
Demonstration only:			
Computer Aided Drafting (Auto CAD / Solid Edge): Introduction to drafting packages and demonstration of their use.			
Total Periods			60
Text Book:			
T1.	Basant Agrawal and C.M Agrawal ,“Engineering Drawing ”,Tata McGraw Hill ,Third Edition,2019		
T2	Jain and Gautam ,“Engineering Graphics & Design ”,Khanna Publishing House, 2018		
Reference Book :			
R1.	Dr.P.Kannan and Dr.J.Bensam Raj, “Engineering Graphics”, JBR Tri Sea Publishers Pvt. Ltd,2018.		
R2.	K.V Natarajan, "Engineering Drawing and Graphics", M/s. N.Dhanalakshmi, Chennai,2014.		
R3.	K.Venugopal and V. Prabhu Raja, “Engineering Graphics”New Age International Publishers,2011.		
R4.	N.S Parthasarathy and Velamurali, “ Engineering Graphics”, Oxford University, New Delhi,2015		
R5.	Bhatt N.D and Panchal V.M, “Engineering Drawing”, Charotar Publishing House,50 th Edition,2010		
e-RESOURCES:			
E1.	http://nptel.ac.in/courses/105104148 , “Engineering Graphics” - Dr. Nihar Ranjan Patra , IIT Kanpur		
E2.	http://cfd.annauniv.edu/webcontent.htm , “Engineering Graphics” - Dr.Velamurali		
E3.	http://link.springer.com/ “Engineering Graphics”-Springer Nature.		

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Programme	B.E/B.Tech			Programme code			-			Regulation			2023										
Department	CSE, EEE, ECE, IT, BT, CST & BME						Semester			I													
Course Code	Course name						Periods per week			Credit	Maximum Marks												
U23GE102	Design Thinking						L	T	P	C	CA	ESE	Total										
							1	0	2	1	50	50	100										
Course Objective	The student should be made to, <ul style="list-style-type: none"> familiarize with design thinking concepts and principles practice the methods, processes and tools of design thinking. apply the design thinking approach and have ability to model real world situations. 																						
	At the end of the course, the student should be able to, <table border="1" style="width:100%; border-collapse: collapse;"> <tr> <td>CO1: Understand and apply the concept of team building activity</td> <td>KL</td> </tr> <tr> <td>CO2: Understand Design Thinking and apply the design thinking approach to empathize situations in real world</td> <td>K2</td> </tr> <tr> <td>CO3: Identify various methods of empathy and define the problem</td> <td>K3</td> </tr> <tr> <td>CO4: Develop creative ideas through design thinking</td> <td>K4</td> </tr> <tr> <td>CO5: Understand benefits of learning through observation, experience and application</td> <td>K5</td> </tr> </table>														CO1: Understand and apply the concept of team building activity	KL	CO2: Understand Design Thinking and apply the design thinking approach to empathize situations in real world	K2	CO3: Identify various methods of empathy and define the problem	K3	CO4: Develop creative ideas through design thinking	K4	CO5: Understand benefits of learning through observation, experience and application
CO1: Understand and apply the concept of team building activity	KL																						
CO2: Understand Design Thinking and apply the design thinking approach to empathize situations in real world	K2																						
CO3: Identify various methods of empathy and define the problem	K3																						
CO4: Develop creative ideas through design thinking	K4																						
CO5: Understand benefits of learning through observation, experience and application	K5																						
Pre-requisites	-																						
CO / PO Mapping																							
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 – Weak																							
Programme Outcomes (POs)													CO/PSO Mapping										
COs													PSOs										
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2									
CO 1	2	3	3	3	3	2	2	3	3	3	2	2	3	3									
CO 2	3	3	3	3	3	3	3	3	3	3	3	3	2	2									
CO 3	3	3	1	2	2	2	2	1	2	1			2	2									
CO 4	3	3	3	3	3	2	2	2	2	2	2	1	2	2									
CO 5	3	3	3	3	1	2	2	2	1	2	2	1	2	2									
Course Assessment Methods																							
Direct																							
1. Continuous Assessment Test through activities, assignment & Quiz 2. Models (Chart/paper/3D) 3. Prototype & Presentation																							
Indirect																							
1. Course - end survey																							
Content of the syllabus																							
SESSION-I												Periods		3									
Introduction – Team Building - Types – 4 C’s of Team Building – Levels of Team Building – Benefits of Team Work – Team Building Activity.																							

SESSION II		Periods	6
Introduction to Design Thinking – Purpose of Design Thinking – Design Thinking Framework, Empathy and related case studies			
SESSION III		Periods	6
Define : Examine and Reflect on the problem.			
SESSION IV		Periods	9
Generating Ideas – Identifying ideas – Bundling the ideas and create concepts – Rapid Prototyping – Idea Refinement.			
SESSION V		Periods	16
Importance & testing the design with people - Retest and redefine results			
Total Periods			40
Textbooks			
1.	Solving Problems with Design Thinking - Ten Stories of What Works by Jeanne Liedtka 2013.		
2.	Idris Mootee, "Design Thinking for Strategic Innovation: What They Can't Teach You at Business or Design School", John Wiley & Sons 2013.		
3.	Yousef Haik and Tamer M.Shahin, “Engineering Design Process”, Cengage Learning, 2 nd edition, 2011		
4.	Design of Business: Why Design Thinking is the Next Competitive Advantage by Roger L. Martin 2009.		
5.	Change by Design: How Design thinking transforms organizations and empires Innovation, 2009, Harper Business, Brown, Tim and Berry.		
References			
1.	Design thinking toolbox by Michael Lewick, Wiley 2020		
2.	Design thinking playbook by Michael Lewrick, Wiley 2019		
3.	Creative Confidence: Unleashing the Creative Potential Within Us All by Tom Kelley 2014		
4.	The Design of Everyday Things: by Don Norman 2013		
E-Resources			
1.	https://www.collectivecampus.io/blog/6-resources-to-help-you-learn-design-thinking		
2.	https://thisisdesignthinking.net/on-design-thinking/design-thinking-resources/		
3.	http://hs.griet.ac.in/pdf/studymaterialsgr20/Design%20Thinking%20Lab%202020-21.pdf		
4.	https://www.mindtools.com/brainstm.html		
5.	https://www.quicksprout.com/. /how-to-reverse-engineer-your-competit		
6.	https://www.youtube.com/watch?v=2mjsDIBaUIM		
7.	thevirtualinstructor.com/foreshortening.html		
Activity Based Learning/Practical Based Learning			
http://dschool.stanford.edu/dgift/			
Online Course			
1.	https://onlinecourses.nptel.ac.in/noc19_mg60/preview		
2.	https://www.ibm.com/design/thinking/page/badges/core-skills		

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Programme	B.Tech.	Programme Code					105	Regulation		2023					
Department	Bio Technology					Semester			I						
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks									
		L	T	P	C	CA	ESE	Total							
U23PH102	PHYSICS LABORATORY	0	0	2	1	60	40	100							
Course Objective	<ul style="list-style-type: none"> ➤ Understand elastic behavior of Materials ➤ Predict viscous force in liquids. ➤ Gain knowledge in measuring the lowest thickness materials ➤ To Identify wavelengths of prominent lines using polychromatic lamp ➤ Observe heat conduction in bad conductor ➤ Understand the principle of interferometer ➤ To learn about the characteristics of Lasers 														
Course Outcome	At the end of the course, the student will be able to										Knowledge Level				
	CO1: Measure the young's modulus of the materials, Rigidity modulus – Torsion pendulum										K3				
	CO2: Calculate Coefficient of viscosity of liquid and thickness of thin wire using Air wedge										K3				
	CO3: Observe and measure the different wavelengths of mercury Spectrum and dispersive power of a prism										K3				
	CO4: Illustrate the conductivity of bad conductors. To know how to determine the velocity of ultrasonic waves in liquid										K3				
	CO5: To understand the importance of laser beam compared to ordinary light										K2				
CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													CO/PSO Mapping		
COs	Programme Outcomes (POs)											PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PS O 2	PS O 3
CO 1	3	1											2		
CO 2	3	3	1	2	2								2		
CO 3	3	2			2								3		
CO 4	3	3		1									1		
CO 5	3	1	1		1								2		
Course Assessment Method															
Direct															

<ol style="list-style-type: none"> 1. Prelab and post lab test 2. Execution of experiment and Viva-Voce 3. End-Semester examinations 		
Indirect		
Course - end survey		
Content of the syllabus		
S.No.	Experiments	CO
1.	Determination of Young's modulus of the material - Uniform bending method	CO1
2.	Determination of Young's modulus of the material - Non uniform bending method	CO1
3.	Determination of Rigidity modulus – Torsion pendulum	CO1
4.	Determination of Coefficient of viscosity of a liquid – Poiseuille's method	CO2
5.	Determination of thickness of a thin material – Air wedge method	CO2
6.	Determination of wavelength of mercury spectrum – spectrometer grating	CO3
7.	Determination of Dispersive power of a prism – Spectrometer	CO3
8.	Determination of thermal conductivity of metallic glass using Lee's Disc Method	CO4
9.	Determination of velocity of sound and compressibility of liquid – Ultrasonic interferometer	CO4
10.	Determination of Wavelength and particle size using Laser	CO5
Total Periods		30
Lab Manual		
1.	R. Jayaraman, Engineering Physics Laboratory Manual, Pearson Pub, Edition-2021.	
2.	K. Katiyar & C.K. Pandey Engineering Physics: Theory and Practical, Wiley Pub, 2nd Edition.	



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Programme	B.E. / B.Tech.,	Programme Code			Regulation			2023																																																																																																																																										
Department	CSE, EEE, ECE, IT, BT, CST & BME			Semester			I																																																																																																																																											
Course Code	Course Name			Periods Per Week			Credit	Maximum Marks																																																																																																																																										
				L	T	P	C	CA	ESE	Total																																																																																																																																								
U23CS102	Programming for Problem Solving Laboratory			0	0	2	1	60	40	100																																																																																																																																								
Course Objective	<p>The main objective of the course is to</p> <ul style="list-style-type: none"> Develop simple C programs to illustrate the applications of User Defined and Derived Data Types such as Arrays, Pointers, Structures, and Functions. 																																																																																																																																																	
Course Outcome	At the end of the course, the student should be able to,								Knowledge Level																																																																																																																																									
	CO1: Develop C programs for computer based solution of simple real world problems using Conditional and Looping statements								K3																																																																																																																																									
	CO2: Implement simple C Programs using Strings and Arrays								K3																																																																																																																																									
	CO3: Implement C program for simple applications using Pointers								K3																																																																																																																																									
	CO4: Write C programs that perform operations on File								K4																																																																																																																																									
	CO5: Demonstrate C Programs using Structures								K3																																																																																																																																									
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List of Experiments												CO's																																																																																																																																						
1. Write a C program that accepts an employee's ID, total worked hours in a month and the amount he received per hour. Print the ID and salary (with two decimal places) of the employee for a particular month.												CO1																																																																																																																																						

2. Write a program in C to calculate the sum of three numbers with input on one line separated by a comma.	CO1
3. Write a program in C to find the sum of the series $[x - x^3 + x^5 + \dots]$.	CO1
4. Write a program in C to find the number and sum of all integers between 100 and 200 which are divisible by 9.	CO1
5. Write a program in C to count the total number of duplicate elements in an array.	CO2
6. You are given an input string 'S'. Your task is to find and return all possible permutations of the input string. Note: 1. The input string may contain the same characters, so there will also be the same permutations. 2. The order of permutation does not matter. Sample Input xyz sample Output xyz, xzy, yxz, yzx, zxy, zyx Sample Output : All the possible permutations for string "XYZ" will be "XYZ", "XZY", "YXZ", "YZX", "ZXY" and "ZYX".	CO2
7. Find the Smallest and Largest Element in an Array Method 1: Traverse the array iteratively and keep track of the smallest and largest element until the end of the array. Method 2: Traverse the array recursively and keep track of the smallest and largest element until the end of the array. Method 3: Sort the array using STL and return the first element as the smallest element and the last element as the largest element. For example, consider the array. arr = { 1, 2, 3, 4, 5 } Sample output: Smallest element: 1 Largest element: 5	CO2
8. Write a C program to find the sum of all the multiples of 3 and 5 below 100 using pointers. We have to find the number of numbers which are multiples of both 3 and 5 in the first 100 natural numbers. Multiples of both 3 and 5 in the first 100 natural numbers are the multiples of LCM of 3 and 5. LCM of 3 and 5 = $3 \times 5 = 15$ Sample output: Multiples of 15 below 100 are 15, 30, 45, 60, 75 and 90.	CO3
9. Write a C program to count number of characters, words and lines in a text file. Logic to count characters, words and lines in a file in C program. How to count total characters, words and lines in a text file in C programming. Example Source file I love programming. Working with files in C programming is fun. I am learning C programming at VCEW. Sample output Total characters = 100 Total words = 18 Total lines = 3	CO4

10. Write a C program to implement Student database using Structure		CO5
Sample output:		
Enter details of student:		
Name :abi		
RollNo:101		
Percentage :89.7		
Entered details:		
Name: abi		
RollNo: 101		
Percentage: 89.70		
Total Periods		45
Tools Required		
Codetandra / HackerRank / HackerEarth / Any online Problem Solving Platforms		
E-Resources		
1.	https://www.programiz.com/c-programming	
2.	https://www.cprogramming.com/	
3.	https://beginnersbook.com/2015/02/simple-c-programs/	



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Programme	B.TECH	Programme code	105	Regulation	2023																																																																																																																			
Department	Biotechnology			Semester	I																																																																																																																			
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U23MCFY1	Environmental Science and Engineering	2	0	0	0	100	0	100																																																																																																																
Objective	<p>The main objective of this course is to:</p> <ul style="list-style-type: none"> Familiarize basics of ecosystem and creating environmental awareness. Congregate about environmental pollution. Contrast on solid waste and social issues. Acquire knowledge in environmental legislation and protection. <p>Summarize population growth, human rights and Environment.</p>																																																																																																																							
Outcomes	The students who complete this course successfully are expected to:							Knowledge Level																																																																																																																
	CO1: Acquire knowledge about Eco-system, Natural resources and Bio- diversity.							K1																																																																																																																
	CO2: Be aware of Environmental Pollution and its control.							K3																																																																																																																
	CO3: Infer and express Solid waste management and Social issues.							K3																																																																																																																
	CO4: Acquire Knowledge about Environmental legislation and protection.							K3																																																																																																																
	CO5: Awareness about population growth, human rights and Environment							K2																																																																																																																
Pre-requisites	Nil																																																																																																																							
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Unit - I	INTRODUCTION TO ENVIRONMENTAL SCIENCE AND											Periods	6																																																																																																											

ENGINEERING			
Nature and scope of environmental education- Natural Resources – (Forest, Water, Food,& Land Resources) problems and remedial measures, Ecosystem and Biodiversity- Ecosystem-Structure, Characteristics and functions of ecosystem - Biodiversity – Definition – Conservation of Biodiversity (in-situ and Ex-situ)-Values and Threats of Biodiversity Environmental awareness and sustainable development.			
Unit - II	ENVIRONMENTAL POLLUTION AND ITS CONTROL	Periods	6
Water pollution-causes, effects and control measures of water pollution- Waste water treatment process (Secondary-BOD,COD) - Air Pollution – Types of Air pollutants-CO ₂ , SO ₂ , NO ₂ , PAN-Sources- control measures (Electro static precipitator, Bag house filter, Wet Scrubber and cyclone separator).			
Unit - III	SOCIAL ISSUES AND SUSTAINABILITY	Periods	6
Solid waste Management-Types (E-Waste, Hazardous waste, Bio-waste)-Disposal method. Sustainability-Definition-Sustainable development Goals-Environmental issues-global warming and Ozone depletion, Climate change, Acid rain, Carbon foot print-Possible solutions to Environmental issues			
Unit - IV	SUSTAINABILITY PRACTICES AND ENVIRONMENTAL LEGISLATION	Periods	6
Zero waste and R-Concept-Circular economy, Material life cycle assessment-EIA, Energy efficiency and management-Environmental Legislation-Air act, Water Act-Wildlife protection act-Environmental protection act.			
Unit - V	Human population and the environment	Periods	6
Population growth, Human rights, Value education, environment and Human health, Family welfare Program, Women and Child welfare, Role of information technology in environment – Satellite, Data base, Geographical Information System (GIA), Environmental impact Analysis (EIA) and Human health			
			Total Periods
30			
Text books			
1.	Dr.S. Vairam - “Environment Science and Engineering” Gems publication. Edition 2018		
2.	Dr.S. Mageswari,Dr. G.Vijayakumar, Ms.A. Preethi, Environmental Science and Engineering, RK Publications, Revised Edition 2022		
Reference books			
1.	Linda Williams- “Environmental Science”-Tata McGRAW – Hill Edition. Edition-I-2008		
2.	T.G.Miller Jr-“Environmental Science”-Wadsworth publishing Co. Edition -10-2004		
3.	William P. Cunningham, Barbara Woodworth Saigo- Tata McGraw Hill.Edition-4-2011		
4.	NPTEL Course Notes		
5.	Cunnighum and cooper-“Environmental Science”-Jaico Publ, House Edition-4-2007		
E-Resourses			
1	https://libraries.ou.edu/		
2	https://libguides.reading.ac.uk/		
3	https://www.loc.gov/ , https://rdl.lib.uconn.edu/		



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Programme	B.E./B.Tech	Programme Code	105	Regulation	2023											
Department	Biotechnology			Semester	II											
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks										
		L	T	P	C	CA	ESE	Total								
U23MA202	Complex Analysis and Ordinary Differential Equations	3	1	0	4	40	60	100								
Course Objective	The Main Objective of the course is to <ul style="list-style-type: none"> Understand the Analytic functions and Bilinear transformations. Proficiently understand the Complex Integration. Demonstrate Vector Differentiation and Integration.. To know about the Ordinary Differential Equations. Identify the Laplace Transform of Derivatives and Integrals. 															
Course Outcome	At the end of the course, the student should be able to,						Knowledge level									
	CO1: Analyze the construction of analytic functions.						K3, K4									
	CO2: Apply the concepts of cauchy's integral theorem and residue theorem in evaluation of complex integrals.						K2, K3									
	CO3: Apply Green's , Stoke's and Gauss Divergence theorems.						K1, K5									
	CO4: Understand the concepts of solving second order differential equations.						K2, K5									
	CO5: Apply the concepts of Laplace transform in solving ODE.						K5, K3									
Pre-requisites	-															
CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak																
COs		Programme Outcomes (POs)											CO/PSO Mapping			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1		3		2	1	1								2		
CO 2		3	2	1	1									2		
CO 3		3	2		1									2		
CO 4		3	2		1	1								2		
CO 5		3	2	1	1									2		
Course Assessment Methods																
Direct																
7. Continuous Assessment Test I, II & III																
8. Assignment.																
9. End-Semester examinations																
Indirect																
3. Course - end survey																
Content of the syllabus																
Unit – I	ANALYTIC FUNCTIONS											Periods	12			

Analytic functions – Necessary and sufficient conditions for analyticity in Cartesian and polar coordinates - Properties – Harmonic conjugates – Construction of analytic function - Conformal mapping – Mapping by functions $c+z$, cz , $1/z$ and Bilinear transformation.			
Unit - II	COMPLEX INTEGRATION	Periods	12
Problem solving using Cauchy’s integral theorem and integral formula- Taylor’s and Laurent’s expansions- Residues- Cauchy’s residue theorem- Application: Contour integration over unit circle.			
Unit – III	VECTOR DIFFERETIATION & INTEGRATION	Periods	12
Vector Differentiation: Vector and Scalar Functions- Derivatives- Curves, Gradient of a Scalar Field- Directional Derivative -Divergence of a Vector Field - Curl of a Vector Field – Line, Surface and Volume integrals (concepts only), Green’s theorem in a plane(excluding proof), Gauss Divergence theorem(excluding proof), Stoke’s theorem (Excluding proof).			
Unit - IV	ORDINARY DIFFERENTIAL EQUATIONS	Periods	12
Second order Linear ordinary differential equations with constant coefficients, Cauchy’s - Euler equations(excluding proof)- Legendre’s Linear differential equations(excluding proof) - Method of variation of parameters.			
Unit – V	LAPLACE TRANSFORMS	Periods	12
Existence conditions – Transforms of elementary functions – Transform of unit step function and unit impulse function – Basic properties – Shifting theorems(excluding proof) -Transforms of derivatives and integrals – Initial and final value theorems(excluding proof) – Inverse transforms – Convolution theorem(excluding proof) – Transform of periodic functions – Application to solution of linear second order ordinary differential equations with constant coefficients.			
Total Periods			60
Text Books			
3.	Grewal B.S., “Higher Engineering Mathematics”, Khanna Publishers, New Delhi, 43rd Edition, 2014.		
4.	Ravish R Sing , Mukul Bhatt, “Engineering Mathematics”, Mc Graw Hill Education Pvt. Ltd- 2018		
5.	Sivaramakrishna Das. P, Vijayakumari.C, “ Engineering Mathematics – II”, Pearson India Education Pvt. Ltd-2022.		
References			
6.	Wylie, R.C. and Barrett, L.C., “Advanced Engineering Mathematics” , Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.		
7.	Kreyszig, E., Advanced Engineering Mathematics (10th Edition), John Wiley (2015).		
8.	Alan Jefferis , Advanced Engineering Mathematics,Academic Press- New Delhi-2003		
9.	Yunus A.Cengel, William J.Palm III,” Differential equations for Engineers & Scientists”, Tata McGraw Hill Education Pvt. Ltd, 6th Edition, New Delhi, 2012.		
10.	John Bird, Higher Engineering Mathematics, Anuradha Agencies(2004)		
Resources			
1.	https://en.wikipedia.org/wiki/Ordinary_differential_equation		
2.	w.learnerstv.com/Free-engineering-Video-lectures		
3.	w.nptel.ac.in		



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Programme	B.TECH	Programme code	105	Regulation	2023											
Department	Biotechnology			Semester	II											
Course code	Course name	Periods per week			Credit	Maximum Marks										
		L	T	P	C	CA	ESE	Total								
U23CH201	Engineering Chemistry	3	0	0	3	40	60	100								
Objective	The main objective of this course is to: <ul style="list-style-type: none"> Recognize the basic technology requirements in water treatment Gain knowledge in basics and preparations, properties and applications of Polymers. Enrich the Knowledge of the students with the basics of Nano materials, their properties and applications. Familiarize about the Non renewable, renewable energy and different types of storage devices in the engineering application. Gain knowledge in destruction and protection of metals for engineering applications. 															
Outcomes	The students who complete this course successfully are expected to:						Knowledge Level									
	CO1: Implement innovative solutions in wastewater treatment process.						K3									
	CO2: Familiarize with the applications of polymers in the field of engineering.						K3									
	CO3: Identify the synthesis methods of Nanoparticles and their industrial applications						K2									
	CO4: Recognize the renewable, non renewable energy and storage devices for domestic and industrial applications.						K3									
	CO5: Categorize the metal corrosion in different environment and find out appropriate control techniques to avoid corrosion.						K3									
Pre-Requisites																
CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak													CO/PSO Mapping			
COs		Programme Outcomes (POs)											PSOs			
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO 1		3	3	3	2	1	2	2	2					1	1	2
CO 2		3	2	2	2		2	2	1					2	2	2
CO 3		3	2	2	3	2	1	2	1					2	1	1
CO 4		3	3	2	2	1	1	3	2					3	2	2
CO 5		3	3	3	2	1	2	2	1					2	1	2

	Course Assessment Methods		
	Direct		
	1.Continuous Assessment Test I, II & III 2.Assignment 3.End-Semester examinations		
	Indirect		
	Course - end survey		
	Content of the syllabus		
Unit - I	WATER TECHNOLOGY	Periods	9
Introduction-Sources and impurities in Water, Soft and Hard water, Water quality parameters, Types of Hardness – Determination of Hardness by EDTA method, Domestic Water Treatment. Boiler Feed Water –Requisites, Problems due to hard water in boilers - Scale and Sludge formation in boilers-Caustic Embrittlement-Boiler corrosion, Treatment of boiler feed Water – Internal conditioning (Carbonate, Phosphate, and Calgon conditioning) External conditioning – Ion exchange process, Zeolite process, Brackish water –Water purification by Reverse osmosis.			
Unit - II	POLYMER CHEMISTRY	Periods	9
Introduction - Occurrence, definitions – Functionality - Degree of Polymerization, Classification of polymers – structure (Linear, Branched & network polymer structure) block, random & graft copolymers,Tacticity, Tg, molecular weight - number and weight average method. Types of polymerizations: Addition, condensation and copolymerization. Mechanism of polymerization (Free radical). Preparation, properties and applications of PE, PMMA, PC, Nylon6, Nylon 66, Poly urethane, Poly isoprene and vulcanization of rubber, Teflon, PET, and Bakelite.			
Unit - III	NANO CHEMISTRY	Periods	9
Basics- distinction between molecules, nanoparticles and bulk materials; size dependent properties. Nanoparticles: nanocluster, nanorod, nanotube (CNT) and nanowires. Synthesis: Top down process- Laser ablation,Spray Pyrolysis, Chemical Vapour deposition, Electro deposition. Bottom up process- Precipitation, Sol-gel, Thermolysis - hydrothermal, solvothermal -Properties and applications of nano materials in medical and electronic devices.			
Unit - IV	ENERGY RESOURCES AND STORAGE DEVICES	Periods	9
Nonrenewable energy - Nuclear energy, nuclear reaction and its types, nuclear power plant and its working (Light water nuclear power plant & Breeder reactor). Renewable energy and its sources - Solar Energy - Photo voltaic cells, Importance of Solar cells - p-n junctions in Solar cells - Working of Photovoltaic cell, Recent advances in solar cell materials, Wind energy - Types of Wind Power Plants (WPPs), Components and working of WPPs. Batteries and fuel cells: Types of batteries -Alkaline battery, lead storage battery, Ni-Cd battery, lithium battery, Fuel cell - H ₂ -O ₂ fuel cell-applications.			
Unit - V	CORROSION AND ITS CONTROL	Periods	9
Introduction, Types of corrosion - chemical and electrochemical corrosion, mechanism, Pilling -Bedworth rule, Types of electrochemical corrosion – Galvanic corrosion, Pitting corrosion, Crevice corrosion, Corrosion on wire fence and Pipeline corrosion, Factors influencing rate of corrosion, corrosion control methods – Sacrificial anode and impressed cathodic current. Protective coatings – Paints: constituents and functions, Metallic coatings - steps involved in cleaning the surface for Electroplating, Electroplating (Au), Electro less plating (Ni).			
		Total Periods	45
Text Books:			
1.	O.G.Palanna, “Engineering Chemistry “Tata Mc GrawHill PVT,Ltd. Second Edition -2017		
2.	Dr.S.Mageswari, Dr.K.Balachandran, M.S.Viswaksenan, Engineering Chemistry : First Edition, RK publication, Edition-2022		
References:			
1.	Engineering Chemistry: Jain & Jain, Dhanpat Rai Publishing Company Edition- 16- 2015.		
2.	Arun Bahl, B.S. Bahl, G.D. Tuli, Essentials of Physical Chemistry, Published by S. Chand & Company Ltd, 2014		

3.	Engineering Chemistry: Sashi Chawla, Dhanpat Rai & Co (pvt.)ltd. Edition- 5- 2013.
4.	Dr.S.Vairam ,Dr.Suba Ramesh, Engineering Chemistry: First Edition, Wiley publication,Reprint-2016
E-Resources.	
1	https://www.who.int/water_sanitation_health/dwq/arsenicun6.pdf
2	https://www.schandpublishing.com/books/tech-professional/applied-science/a-textbook-polymer-chemistry/9788121941129/#.XdZ214MzY2w
3	https://www.elsevier.com/books/nanochemistry/klabunde/978-0-444-59397-9



VIVEKANANDHA COLLEGE OF ENGINEERING FOR WOMEN
(Autonomous Institution Affiliated to Anna University Chennai)
Elayampalayam, Tiruchengode – 637 205



Programme	B.E./B.Tech	Programme Code	-	Regulation	2023										
Department	Common to CSE,IT,BT,CST branches			Semester	II										
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks									
		L	T	P		C	CA	ESE	Total						
U23EE201	Basic Electrical and Electronics Engineering	3	0	0	3	40	60	100							
Course Objective	The students should made to <ul style="list-style-type: none"> • Introduce the basics of electric circuits and analysis • Impart knowledge in the basics of working principles and application of electrical machines • Learn the electrical wiring methods • Analyze the characteristics of Semiconductor devices • Educate on the fundamental concepts of digital electronics and introduce the functional elements and working of measuring instruments 														
Course Outcome	At the end of the course, the student should be able to,						Knowledge Level								
	CO1: Understand the basics of electric circuits and type of the connection						K2								
	CO2: Understand the basics of electromagnetic laws and basic working principle of DC and AC machines.						K2								
	CO3: Understand the concepts of tariff, energy saving, illumination, electric lamps and safety measures.						K2								
	CO4: Understand the basic operating characteristics of semiconductor devices.						K2								
CO5: Understand the fundamentals of digital logics and measuring instruments						K2									
Pre-requisites	Basic concepts and understanding of magnetic fields														
CO / PO Mapping												CO/PSO Mapping			
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak															
COs	Programme Outcomes (POs)												PSOs		
	P O 1	P O 2	P O 3	P O 4	P O 5	P O 6	PO 7	PO 8	P O 9	P O 10	P O 11	PO 12	PSO1	PSO 2	PSO3
CO 1	3	2	1				1				3	3		2	
CO 2	3	2	1				1				3	3		2	
CO 3	3	1	1				1				3	3		3	
CO 4	3	2	1				1				3	3		2	
CO 5	3	2	1				1				3	3		2	
Course Assessment Methods															
Direct															
1. Continuous Assessment Test I, II & III 2. Assignment 3. End-Semester examinations															
Indirect															
4. Course –end Survey															
Content of the syllabus															

Unit – I	INTRODUCTION OF ELECTRICAL CIRCUITS	Periods	9
Definition of Voltage, Current, Power, Energy, Power factor, Circuit parameters, Ohm’s law, Kirchoff’s law Introduction to AC Circuits and Parameters: Waveforms, Average value, RMS Value, Real power, Reactive power and Apparent power, Power factor. Introduction to three phase systems - types of connections Concept of DC circuits.			
Unit - II	ELECTRICAL MACHINES AND ITS APPLICATIONS	Periods	9
Faraday’s laws of electromagnetic induction - Lens law - Fleming's left hand rule and Right hand rule. Working principle and construction of AC and DC machines - Construction, Working principle and Applications of single phase Transformer. Motor used for domestic applications.			
Unit – III	WIRING AND ILLUMINATION	Periods	9
Types of wiring-staircase and corridor wiring - wiring accessories. Different types of safety measures - Earthing. Electrical tariff -Energy conservation. Simple layout of power system-various energy resources, The Laws of Illumination- Different types of electrical lamps.			
Unit - IV	SEMICONDUCTOR DEVICES	Periods	9
PN junction diodes - Zener diodes - characteristics. Transistors: PNP and NPN transistors - Theory of operation - Transistor configurations -characteristics - comparison. Special semiconductor devices: FET - SCR - LED – V-I characteristics – Rectifier and Inverters -UPS – SMPS.			
Unit – V	DIGITAL FUNDAMENTALS AND MEASUREMENTS	Periods	9
Number systems - Boolean Theorems – DeMorgan's Theorem - Logic gates -Implementation of Boolean Expression using Gates - SOP and POS forms- Functional elements of an instrument, Standards and calibration, Operating Principle of Ammeters and Voltmeters.			
Total Periods			45
Text Books			
1.	S.K.Bhattacharya, “Basic Electrical and Electronics Engineering”, Pearson, 2017		
2.	D.P. Kotharti and I.J Nagarath, “Basic Electrical and Electronics Engineering”, Mc Graw Hill, Third Edition, 2020.		
References			
1.	S.B. Lal Seksena and Kaustuv Dasgupta, “Fundaments of Electrical Engineering”, Cambridge, 2016		
2.	Mittle, Mittal, Basic Electrical Engineering, 2nd Edition, Tata McGraw-Hill Edition, 2016.		
3.	T.K. Nagsarkar and M.S. Sukhija, “Basic Electrical Engineering”, Oxford, 2017.		
4.	John Bird, “Electrical and Electronic Principles and Technology”, Fourth Edition, Elsevier, 2010.		
5.	K Murugeskumar, “Elements of Electrical Engineering”, Vikas Publishing House Pvt. Ltd. 2011.		
E-Resources			
1.	https://nptel.ac.in/courses		
2.	https://www.electrical4u.com/electrical-engineering-articles/illumination-engineering/		
3.	https://ocw.mit.edu/courses/electrical-engineering-and-computer-science/6-002-circuits-and-electronics-spring-2007/lecture-notes		
4.	https://www.google.co.in/books/edition/_/4nJROSC7iK8C?hl=en&gbpv=1		





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Elayampalayam, Tiruchengode – 637 205





Programme	B.E/B.Tech.	Programme code	105	Regulation	2023			
Department	BIO TECHNOLOGY		Semester		II			
Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U23TA202	தமிழரும் தொழில்நுட்பமும் / TAMILS AND TECHNOLOGY	1	0	0	1	40	60	100
	Content of the syllabus							
அலகு 1	நெசவு மற்றும் பானைத் தொழில்நுட்பம்				Periods	3		
சங்ககாலத்தில் நெசவுத்தொழில் – பானைத்தொழில்நுட்பம் – கருப்பு சிவப்பு பாண்டங்கள் – பாண்டங்களில் கீறல் குறியீடுகள்.								
அலகு 2	வடிவமைப்பு மற்றும் கட்டிடத் தொழில்நுட்பம்				Periods	3		
சங்ககாலத்தில் வடிவமைப்பு மற்றும் கட்டுமானங்கள் & சங்ககாலத்தில் வீட்டுப் பொருட்களில் வடிவமைப்பு- சங்ககாலத்தில் கட்டுமான பொருட்களும் நடுகல்லும் – சிலப்பதிகாரத்தில் மேடை அமைப்பு பற்றிய விவரங்கள் –மாமல்லபுரச் சிற்பங்களும் , கோவில்களும் – சோழர்காலத்துப் பெருங்கோயில்கள் மற்றும் பிறவழி பாட்டுத்தலங்கள் – நாயக்கர் காலக்கோயில்கள் – மாதிரி கட்டமைப்புகள் பற்றி அறிதல், மீனாட்சிஅம்மன்ஆலயம்மற்றும்திருமலைநாயக்கர்மஹால் – செட்டிநாட்டுவீடுகள் – பிரிட்டிஷ் காலத்தில் சென்னையில் இந்தோ - சாரோசெனிக்கட்டிடக்கலை.								
அலகு 3	உற்பத்தித்தொழில்நுட்பம்				Periods	3		
கப்பல் கட்டும் கலை – உலோகவியல் – இரும்புத் தொழிற்சாலை – இரும்பை உருக்குதல் ,எஃகு – வரலாற்றுச் சான்றுகளாக – செம்பு மற்றும் தங்க நாணயங்கள் – நாணயங்கள் அச்சடித்தல் – மணி உருவாக்கும் தொழிற்சாலைகள் – கல்மணிகள், கண்ணாடி மணிகள் – சுடுமண்மணிகள் – சங்குமணிகள் – எலும்புத்துண்டுகள் – தொல்லியல் சான்றுகள் – சிலப்பதிகாரத்தில் மணிகளின் வகைகள்.								
அலகு 4	வேளாண்மைமற்றும்நீர்ப்பாசனத்தொழில்நுட்பம்				Periods	3		
அணை, ஏரி, குளங்கள், மதகு – சோழர் காலக் குழுழித் தூம்பின் முக்கியத்துவம் – கால்நடை பராமரிப்பு – கால்நடைகளுக்காக வடிவமைக்கப்பட்ட கிணறுகள் – வேளாண்மை மற்றும் வேளாண்மைச் சார்ந்த செயல்பாடுகள் – கடல்சார் அறிவு – மீன்வளம் – முத்து மற்றும் முத்துக்குளித்தல் – பெருங்கடல் குறித்த பண்டைய அறிவு – அறிவுசார்சமூகம்.								

அலகு 5	அறிவியல் தமிழ் மற்றும் கணினித்தமிழ்	Periods	3
அறிவியல் தமிழின் வளர்ச்சி – கணினித் தமிழ் வளர்ச்சி – தமிழ்நூல்களை மின்பதிப்பு செய்தல் – தமிழ் மின்பொருட்கள் உருவாக்கம் – தமிழ் இணையக்கல்விக்கழகம் – தமிழ் மின்நூலகம் – இணையத்தில் தமிழ் அகராதிகள் – சொற்க்குவைத்திட்டம்.		Total Periods	15

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Programme	B.E/B.Tech.	Programme code	105	Regulation	2023			
Department	BIO TECHNOLOGY		Semester		II			
Course code	Course name	Periods per week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U23TA202	TAMILS AND TECHNOLOGY	1	0	0	1	40	60	100
Content of the syllabus								
UNIT I	WEAVING AND CERAMIC TECHNOLOGY				Periods	3		
Weaving Industry during Sangam Age – Ceramic technology – Black and Red Ware Potteries (BRW) –Graffiti on Potteries								
UNIT II	DESIGN AND CONSTRUCTION TECHNOLOGY				Periods	3		
Designing and Structural construction House & Designs in household materials during Sangam Age - Building materials and Hero stones of Sangam age – Details of Stage Constructions in Silappathikaram - Sculptures and Temples of Mamallapuram - Great Temples of Cholas and other worship places - Temples of Nayaka Period - Type study (Madurai Meenakshi Temple)-Thirumalai Nayakar Mahal - Chettinadu Houses, Indo - Saracenic architecture at Madras during British Period.								
UNIT III	MANUFACTURING TECHNOLOGY				Periods	3		
Art of Ship Building - Metallurgical studies - Iron industry - Iron smelting, steel -Copper and gold- Coins as source of history - Minting of Coins – Beads making-industries Stone beads - Glass beads - Terracotta beads -Shell beads/ bone beats - Archeological evidences - Gem stone types described in Silappathikaram.								
UNIT IV	AGRICULTURE AND IRRIGATION TECHNOLOG				Periods	3		
Dam, Tank, ponds, Sluice, Significance of Kumizhi Thoompu of Chola Period, Animal Husbandry - Wells designed for cattle use - Agriculture and Agro Processing - Knowledge of Sea - Fisheries – Pearl - Conche diving - Ancient Knowledge of Ocean - Knowledge Specific Society.								
UNIT V	SCIENTIFIC TAMIL & TAMIL COMPUTING				Periods	3		
Development of Scientific Tamil - Tamil computing – Digitalization of Tamil Books – Development of Tamil Software – Tamil Virtual Academy – Tamil Digital Library – Online Tamil Dictionaries – Sorkuvai Project.								
					Total Periods	15		
TEXT-CUM-REFERENCE BOOKS								

1	தமிழகவரலாறும் – மக்களும்பண்பாடும் – கே.கே. பிள்ளை (வெளியீடு: தமிழ்நாடு பாடநூல் மற்றும் கல்வியியல் பணிகள்கழகம்).
2	கணினித்தமிழ் – முனைவர்இல. சுந்தரம். (விகடன்பிரசுரம்).
3	கீழடி – வைகைநதிக்கரையில்சங்கநகரநாகரிகம் (தொல்லியல்துறைவெளியீடு)
4	பொருநை - ஆற்றங்கரைநாகரிகம். (தொல்லியல்வெளியீடு)
5	Social Life of Tamils (Dr.K.K.Pillay) A joint publication of TNTB & ESC and RMRL – (in print)
6	Social Life of the Tamils - The Classical Period (Dr.S.Singaravelu) (Published by: International Institute of Tamil Studies)
7	Historical Heritage of the Tamils (Dr.S.V.Subatamanian, Dr.K.D. Thirunavukkarasu) (Published by: International Institute of Tamil Studies).
8	The Contributions of the Tamils to Indian Culture (Dr.M.Valarmathi) (Published by: International Institute of Tamil Studies.)
9	Keeladi - 'Sangam City Civilization on the banks of river Vaigai' (Jointly Published by: Department of Archaeology & Tamil Nadu Text Book and Educational Services Corporation, Tamil Nadu)
10	Studies in the History of India with Special Reference to Tamil Nadu (Dr.K.K.Pillay) (Publishedby: The Author)
11	Porunai Civilization (Jointly Published by: Department of Archaeology & Tamil Nadu Text BookandEducational Services Corporation, Tamil Nadu)
12	Journey of Civilization Indus to Vaigai (R.Balakrishnan) (Published by: RMRL) – Reference Book.

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Programme	B.E. / BT.ech.	Programme Code			-	Regulation	2023							
Department	EEE, ECE, BT, BME					Semester	II							
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks								
		L	T	P	C	CA	ESE	Total						
U23CS203	Python Programming	3	0	3	4	50	50	100						
Course Objective	The student should be made to, <ul style="list-style-type: none"> Understand the fundamentals of Python programming Handle list, tuples, sets and Dictionaries data types Learn function prototypes and string functions. Use files and modules for data processing Understand packages in Python and data visualization 													
Course Outcome	At the end of the course, the student should be able to,									Knowledge Level				
	CO1: Interpret the fundamental Python syntax and semantics and be fluent in the use of Python control flow statements.									K3				
	CO2: Perform operations on list, tuples, sets and Dictionaries using python.									K3				
	CO3: Implement function prototypes and string functions.									K3				
	CO4: Apply files and modules and perform operations on CSV files.									K3				
CO5: Perform data visualization and apply Python packages for CSV files									K3					
Pre-requisites	Nil													
CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 – Weak													CO/PSO Mapping	
Cos	Programme Outcomes (POs)												PSOs	
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2
CO 1	3	2	1	-	1	-	-	-	-	-	-	2	3	2
CO 2	3	3	1	1	2	-	-	-	-	-	-	2	3	2
CO 3	3	3	1	2	2	-	-	-	-	-	-	2	3	2
CO 4	3	3	1	2	2	-	-	-	-	-	-	2	3	2
CO 5	3	3	1	2	2	-	-	-	-	-	-	2	3	2
Course Assessment Methods														
Direct														
1. Continuous Assessment Test I, II & III														
2. Assignments / Quiz														
3. End-Semester examinations														
Indirect														
1. Course - End survey														
Content of the syllabus														
Unit – I	INTRODUCTION TO PYTHON									Periods	9			
Introduction to Python, features, installing Python, writing and executing Python program — native data types, comments, constants, variables, operators, expression, conditional statements, control statements, continue, pass,														

break.			
Unit - II	LISTS, TUPLES, SETS AND DICTIONARIES	Periods	9
Lists: list operations, list slices, list methods, list loop, mutability, aliasing, cloning lists, list parameters; Tuples: tuple assignment, tuple as return value; Sets: methods and operators, Dictionaries: operations and methods.			
Unit – III	FUNCTIONS AND STRINGS	Periods	9
Functions definition, declaration, arguments, parameters – formal and local, parameter passing methods - function prototypes, recursion; Strings: string slices, immutability, string functions and methods, string module, regular expressions.			
Unit - IV	FILES AND MODULES	Periods	9
Files and exception: Text files, reading and writing files, format operator; command line arguments, errors and exceptions, handling exceptions, modules, accessing CSV file.			
Unit – V	PACKAGES AND DATA VISUALIZATION	Periods	9
Text processing, Numerical processing: numpy package – mean, median and mode, pandas package – vector, dataframe, data visualization: matplotlib, Time operations.			
Suggested List of Experiments			
List of Experiments			CO's
1.	Write a program to demonstrate different number data types in Python.		CO1
2.	Write a program to perform different Arithmetic Operations on numbers in Python.		CO1
3.	Write a program to create, append and remove lists and demonstrate the tuples in python.		CO2
4.	Write a program to demonstrate working with dictionaries in python.		CO2
5.	Write a program to create, concatenate and print a string and accessing sub-string from a given string.		CO3
6.	Write a Python function to calculate the factorial of a number (a non-negative integer). The function accepts the number as an argument.		CO3
7.	Write a program to compute the number of characters, words and lines in a file.		CO4
8.	To write a Python program to find the most frequent words in a text read from a file.		CO4
9.	Find mean, median, mode for the given set of numbers in a list.		CO5
10.	Draw a horizontal bar chart with Matplotlib		CO5
Total Periods			90
Text Books			
1.	Anurag Gupta,G.P BISWAS ,” Python Programming – Problem solving, packages and Libraries, Edition 1, Tata McGraw Hill, 2019		
2.	E Balagurusamy, “Problem Solving and Python Programming”, Edition1, TataMcGraw Hill, 2018		
3.	Reema Thareja, “Python Programming using Problem Solving Approach”, OXFORD University Press, 2017.		
References			
1.	Allen B. Downey, “Think Python: How to Think Like a Computer Scientist“, 2nd edition, Updated for Python 3, Shroff/O’Reilly Publishers, 2016.		
2.	John V Guttag, — Introduction to Computation and Programming Using Python“, Revised and expanded Edition, MIT Press , 2021		
3.	Guido van Rossum (Author), The Python Development Team (Author), An Introduction to Python Tutorial and What’s New ,2022,Shroff Publishers first edition		
Resources			
1.	http://greenteapress.com/wp/think-python/		
2.	https://www.python.org/about/gettingstarted/		
3.	https://beginnersbook.com/2018/03/python-tutorial-learn-programming/		
4.	https://www.tutorialspoint.com/python/index.htm		
5.	https://www.learnpython.org/		
6.	https://www.udemy.com/topic/python/free		



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Programme	B.E /B.TECH	Programme code	105	Regulation	2023										
Department	BIOTECHNOLOGY			Semester	II										
Course code	Course name	Periods per week			Credit	Maximum Marks									
		L	T	P	C	CA	ESE	Total							
U23EN204	Professional Communication	2	0	3	3	50	50	100							
Objective	The main objective of this course is to:														
	<ul style="list-style-type: none"> • Provide suitable reading & writing tasks to develop communicative ability for academic and professional progress • Inculcate channelized reading to make learners proficient in the chosen professional writing contexts. • Improve learners' vocabulary and grammar to supplement their language use at professional contexts • Assist students in the development of intellectual flexibility, creativity, and cultural literacy so that they may engage in life-long learning. • Identify and begin to apply the language features of academic and professional writing and speaking 														
Outcomes	The students who complete this course successfully are expected to:							Knowledge Level							
	CO1: Acquire sufficient command over language to speak at an academic or professional context							K1							
	CO2: Write technically well at professional contexts through exposing them to similar readings.							K1							
	CO3: Use language at length at technical and professional situations through enrichment of vocabulary and strengthening of grammatical knowledge.							K2							
	CO4: Ethically gather, understand, evaluate and synthesize information from a variety of written and electronic sources.							K2							
	CO5: Be proficient in oral communication and writing.							K3							
Pre-requisites	Nil														
CO / PO Mapping													CO/PSO Mapping		
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1– Weak															
COs	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CO 1					2			3	3		3		2		
CO 2					2			3	3		3		2		
CO 3					2			3	3		3		2		
CO 4					2			3	3		3		2		
CO 5					2			3	3		3		2		

Course Assessment Methods			
Direct			
1. Continuous Assessment Test I & II			
2. Continuous Assessment Test III in the Communication Skills Lab			
3. Assignments			
4. End-Semester examinations			
Indirect			
1. Course – end survey			
Content of the syllabus			
Unit - I		Periods	15
Listening- Listening for Cultural Awareness, Listening to Professional Conversations, Talks, Interviews and Lectures Speaking- Developing Confidence to get rid of Fear on the Dias, Discussion at a Corporate Context. Reading- Inferential Reading, Reading Short Messages and Technical Articles, Writing- Introduction to Letter Writing, Writing Formal and Informal Letters, Thanking Letters, Letters Calling for Quotations, Letters Placing an Order, Seeking clarification, Letters of Complaint. Focus on Language- Adjectives and Degrees of Comparisons			
Unit - II		Periods	15
Listening- Listening to specific information relating to technical content, Listening for statistical information Speaking- Expressing opinions, Formal Discussions, Describing Role Play at Business Context and Consolidating Ideas. Reading- Reading Technical Articles in Journals and Comparing Articles. Writing- Letter seeking permission to undergo practical training and to undertake project work. Focus on Language- Simple, compound and complex sentences and Transformation of Sentences.			
Unit - III		Periods	15
Listening- Listening to understand the overall meaning, Listening to Interviews and Presentations. Speaking- Giving Instructions and Showing Directions and Rephrasing Instructions. Reading- Skimming and Scanning, Reading Job Advertisements. Writing- Applying for a Job, Writing a CV. Writing- Applying for a Job, Writing a CV. Group Discussion: Introduction – Topic Analysis – Thematic Expressions-Objective and content of discussion.			
Unit - IV		Periods	15
Listening- Listening and retrieving Information. Speaking- Developing fluency and Coherence, Accent Neutralization, Voice Modulation, and Intonation, Improving Voice Quality. Reading- Reading and understanding Advertisements. Writing- Letters to the Editor, Letter of Complaint, Various kinds of Reports, Permission to go for Industrial visits. Presentation skills: Making Self Introduction effectively-Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Accents analysis – Stylistics.			
Unit - V		Periods	15
Listening- Listening to Fragmented Texts and Filling in the Blanks. Speaking- Mind Mapping, Developing Coherence and Self-Expression, Making presentations, Paralinguistic and Extra linguistic Features (body language), Reading- Predicting content, Interpreting Reports. Writing- Writing Proposals, Agenda, Minutes of the Meeting. Soft Skills: Introduction - Change in Today’s Workplace: Soft Skills as a Competitive Weapon - Antiquity of Soft Skills - Classification of Soft skills - Ability to work as a team.			
			Total Periods
			75
Text books			
1.	Sumant.S,Pereira Joyce, English for Communication, Vijay Nicole Imprints Pvt.Ltd., 2014.		
2.	Sokkaalingam, S.RM., The Art Of Speaking EnglishVersatile Publishing House,2018.		
Reference books			
1.	Norman Whitby - Business Benchmark Pre-Intermediate to Intermediate, Students Book, Cambridge University Press, 2008. , 1997.		
2.	Dutt, Rajeevan, Prakash .A Course in Communication Skills (Anna University, Coimbatore edition) :: Cambridge University Press India Pvt.Ltd, 2007.		

3.	Meenakshi Raman and Sangeeta Sharma-'Technical Communication English Skills for Engineers'; Oxford University Press, 2008.
4.	S.P. Dhanavel, English and Communication Skills for Students of Science and Engineering, Orient Blackswan Pvt, Ltd, 2009.
5.	Technical English – I & II, Sonaversity, Sona College of Technology, Salem, First Edition, 2012.
E-Resources	
1.	http://www.kalevleataru.com/Publish/Book_Review_Who_Moved_My_Cheese.pdf
2.	http://www.bookbrowse.com/reviews/index.cfm/book_number/304/who-moved-my-cheese
3.	http://www.imdb.com/title/tt0482629/plotsummary



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Programme	B.TECH	Programme code	105	Regulation	2023										
Department	Biotechnology			Semester	II										
Course code	Course name	Periods per week			Credit	Maximum Marks									
		L	T	P	C	CA	ESE	Total							
U23CH202	CHEMISTRY LABORATORY	0	0	2	1	60	40	100							
Objective	<p>The main objective of this course is to:</p> <ul style="list-style-type: none"> • Gather basic simple acid-base reactions and study the mechanism of acid mixture with base. • Learn pH and potential of hydrogen in a sample solution. • Study the redox reaction through potential difference. • Infer iron forms complex with thiocyanate. • Gather knowledge on hardness producing salts and removal of hardness through estimation. • Collect data required for dissolved oxygen present in water sample. • Understand alkalinity and available chlorine present in water sample. 														
Outcomes	The students who complete this course successfully are expected to:							Knowledge Level							
	CO1: Infer knowledge on neutralization reaction between acid, acid mixture with base and identify the concentrations.							K3							
	CO2: Identify the concentration of sample using pH.							K3							
	CO3: Spot the concentration of sample solution through redox reaction by potentiometric method							K4							
	CO4: Estimate Iron by complexation reaction spectrometric ally.							K4							
Pre-requisites	Nil														
	CO / PO Mapping (3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak												CO/PSO Mapping		
COs	Programme Outcomes (POs)												PSOs		
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO1	PSO 2	PSO 3
CO 1	3	3		2	2	1	1						2	2	2
CO 2	3	3		2	2	2	2						2	1	2
CO 3	3	3		2	2	1							1	2	2
CO 4	3	3	1	2	2	1							2	2	
CO 5	2	3	1	2		2	3						2	2	

Course Assessment Methods		
Direct		
1. Pre lab and Post lab Test 2. Execution of Experiment and Viva-voce 3. End semester examination		
Indirect		
Course - end survey		
S.No	Name of the Experiment	Course Outcome
1.	Estimation of HCl using NaOH by Conductometric titration	CO1
2.	Estimation of Mixture of acid using NaOH by Conductometric titration.	CO1
3.	Estimation of Barium Chloride using Sodium Sulphate by Conductometric precipitation titration	CO1
4.	Determination of HCl using NaOH by pH metry	CO2
5.	Estimation of Ferrous iron by Potentiometric titration.	CO3
6.	Estimation of Ferric ion by Spectrophotometry	CO4
7.	Determination of Total, Temporary and Permanent hardness of water by EDTA method.	CO5
8.	Estimation of Dissolved Oxygen content in water by Winkler's method	CO5
9.	Estimation of Alkalinity in water sample.	CO5
10.	Estimation of available Chlorine in bleaching powder.	CO5
Total Periods		30
Lab Manuals suggested:		
1.	Chemistry laboratory I & II by Dr.A.Ravikrishnan,Sri Krishna Pub,Revised Edition-2017	
2.	Chemistry laboratory Manual by Dr.Veeraian, Revised Edition-2017	



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Programme	B.E/B.Tech	Programme Code	102	Regulation	2023											
Department	CSE, EEE, ECE, IT, BT, CST & BME			Semester	II											
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks										
		L	T	P	C	CA	ESE	Total								
U23GE204	Engineering Practices Laboratory	0	0	3	2	60	40	100								
Course Objective	The students should made to															
	1. Know the plumbing line assemblies.															
	2. Weld lap joint, butt joint and T-joint.															
	3. Learn the assembling and dismantling methodology of home appliances.															
	4. Learn the resistor value identification through colors coated on resistor.															
	5. Learn the basics of signal generation in CRO.															
6. Learn the soldering techniques in PCB board for designing the projects.																
Course Outcomes	At the end of the course, the student should be able to,						Knowledge Level									
	CO1: Perform basic machining operations and finish the job to the requirements and quantify the accuracy.						K2									
	CO2: Make various joints such as cross lap joint and Tee lap joint in the carpentry.						K2									
	CO3: Understand the basics of house wiring techniques and the measurements of basic electrical quantities.						K2									
	CO4: Understand the resistor value identification through colors coated on resistor.						K2									
	CO5: Understand the soldering techniques in PCB board for designing the projects.						K2									
Pre -requisites	Nil															
CO / PO Mapping													CO/PSO Mapping			
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak																
COs	Programme Outcomes (POs)												PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3	PSO 4
CO 1	3	2	3	2	2	-	-	-	2	-	-	-	2	2	-	-
CO 2	3	2	3	2	2	-	-	-	2	-	-	-	3	2	-	-
CO 3	3	2	2	3	2	2	-	-	2	-	-	-	2	-	-	-
CO 4	3	2	2	3	2	2	-	-	2	-	-	-	2	-	-	-
CO 5	3	2	3	3	2	2	-	-	2	-	-	-	3	3	-	-
Course Assessment Method																
Direct																
1.Pre lab and Post lab test 2. Record mark 3.End- Semester Examinations																
Indirect																
1.Course –End survey																
Content of the Syllabus																

GROUP A	
(CIVIL & MECHANICAL ENGINEERING)	
(CIVIL ENGINEERING PRACTICE)	
1.Plumbing : a) Single Tap G.I / PVC pipe connection involving the fitting like valves, taps & bends. b) Two Tap G.I / PVC pipe connection involving the fitting like valves, taps & bends.	CO2
2.Carpentry: a) To make a Cross Lap Joint from the given work piece. b) Preparation of ‘ T ’ Lap Joint from the given work piece.	CO2
MECHANICAL ENGINEERING PRACTICE	
3.Welding: a) To join the metal plates by a Butt Joint in arc welding machine. b) To join the metal plates by a Lap Joint in arc welding machine.	CO1
4.Basic Machining: a) To perform simple facing & turning operation. b) To perform of step turning operation.	CO1
5.Sheet Metal Work: a) To make a rectangular tray from the given sheet metal. b) To make a basket from the given sheet metal.	CO1
6.Special Laboratory a) Study of 3D Printing machine and its applications. b) Study of CO ₂ Laser engraving & cutting machine and its applications. c) Study of Wood routing machine and its applications.	CO1
GROUP B	
(ELECTRICAL & ELECTRONICS ENGINEERING)	
ELECTRICAL ENGINEERING PRACTICE	
1. Residential house wiring and stair case wiring using switches, fuse, indicator & lamp.	CO3
2. LED lamp assembly.	CO3
3. Measurement of voltage, current, power & power factor using R-Load.	CO3
4. Measurement of energy using single phase meter.	CO3
5. Measurement of resistance to earth of electrical equipment.	CO3
6. Measurement of illumination in different lamps	CO3
7. Study of batteries.	CO3
ELECTRONICS ENGINEERING PRACTICE	
1. Study of Electronic components and equipments –Resistor, color coding, Inductor, Capacitor and CRO	CO4
2. Logic gates AND, OR, NOR, NAND and NOT.	CO4
3. Generation of Clock Signal.	CO4
4. Soldering practice – Components Devices and Circuits – Using general purpose PCB	CO5
Total Periods	
45	
Reference Book :	
R1	Dr.P.Kannan, Mr.T.Satheeskumar & Mr.K.Rajasekar, “Engineering Practices Laboratory” Manual. First Edition, 2017.
R2	Mr.T.Jeyapooan, Mr.M.Saravana Pandian, “Engineering Practices Lab” Manual, Vikas Publishing House Pvt Ltd, 2017.



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Programme	B.Tech.	Programme Code	105	Regulation	2023			
Department	Bio Technology (BT)			Semester	II			
Course Code	Course Name	Periods Per Week			Credit	Maximum Marks		
		L	T	P	C	CA	ESE	Total
U23MCFY2	Indian Constitution	2	0	0	0	100	NA	100

Course Objective

The main objective of this course is to:

- To know about the basic structure of Indian constitution.
- To know about our Central Government Executive system of India
- To know about our State Government Executive system of India
- To learn the Election system, Amendments and Emergency Provisions given by the constitution.
- To know about the Special Constitutional Provisions in India

Outcome Course	At the end of the course, the student should be able to,	Knowledge level
	<ul style="list-style-type: none"> Understand the functions of the Indian government 	K1
	<ul style="list-style-type: none"> Know about our Central Government, political structure & codes, procedures 	K1
	<ul style="list-style-type: none"> Understand our State Executive & Elections system of India. 	K1
	<ul style="list-style-type: none"> Remember the Election system, Amendments and Emergency Provisions given by the constitution. 	K2
	<ul style="list-style-type: none"> Understand our Special Constitutional Provisions in India 	K2

Pre-requisites ---

CO / PO Mapping													CO/PSO Mapping		
(3/2/1 indicates strength of correlation) 3-Strong, 2 – Medium, 1 - Weak															
COs	Programme Outcomes (POs)											PSOs			
	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PS O1	PSO 2	PSO 3
CO 1						3		3	2						
CO 2						3		3	3						
CO 3						3		3	2						
CO 4						3		3	3						
CO 5						3		3	3						

Course Assessment Methods

Direct
1. Continuous Assessment Test I, II & III
2. Assignment
Indirect
Course - end survey

Content of the syllabus

Unit – I	INTRODUCTION	Periods	6
Historical Background – Constituent Assembly of India – Fundamental Rights – Citizenship – Constitutional Remedies for citizens			
Unit - II	STRUCTURE AND FUNCTION OF CENTRAL	Periods	6
Union Government – Structures of the Union Government and Functions – President – Vice President – Prime Minister – Cabinet – Parliament – Supreme Court of India			
Unit – III	STRUCTURE AND FUCTION OF STATE	Periods	6
State Government – Structure and Functions – Governor – Chief Minister – Cabinet – State Legislature – Judicial System in States – High Courts and other Subordinate Courts			
Unit - IV	ELECTION PROVISIONS, EMERGENCY PROVISIONS, AMENDMENT OF THE CONSTITUTION	Periods	6
Election Commission of India-composition, powers and functions and electoral process. Types of emergency-grounds, procedure, duration and effects. Amendment of the constitution- meaning, procedure and limitations.			
Unit – V	SPECIAL CONSTITUTIONAL PROVISIONS	Periods	6
Directive Principles of State Policy: Importance and its relevance. Special Constitutional Provisions for Schedule Castes, Schedule Tribes & Other Backward Classes, Women & Children.			
Total Periods			30
Text Books			
1.	Durga Das Basu, “Introduction to the Constitution of India “, Prentice Hall of India, New Delhi.		
References			
1.	R.C.Agarwal, (1997) “Indian Political System”, S.Chand and Company, New Delhi		
2.	Indian polity, M.Laksmikanth,Tatamchrawhill publications		
E-Resources			
1.	https://mhrd.gov.in/		
2.	https://niti.gov.in/content/niti-aayog-library		
3.	www.drishtias.com/		