			DE	PARTI	MEN	T OF	BIOT		OLOG ourse o			EMIC	CAL EN	GINE	ERIN	IG								
S	EMESTER - 1 & 2							U			-5													
Course	Course Name					Cor	urse o	utcome	c		1	<u>I</u>				Pı	rograi	n Out	tcome	<u>`</u>	1			
code	Course Maine					COL	uise o	utcome	.o				1	2	3	4	5	6	7	8	9	10	11	12
		CO 1	solve sys quadrati		linea	ar equati	ions, c	liagonal	ize matri	ces and c	character	ise	3	3	3	3	2	1			1	2		2
		CO 2	compute multivar	-			deriva	atives ar	nd maxim	a and mi	nima of		3	3	3	3	2	1			1	2		2
MAT 101	LINEAR ALGEBRA AND CALCULUS	CO 3	compute geometri									of	3	3	3	3	2	1			1	2		2
		CO 4	perform absolute converg						a given	series is	converge	ent,	3	2	3	2	1	1			1	2		2
		CO 5	determir their app			and Fou	urier so	eries ex	pansion o	of function	ons and le	earn	3	3	3	3	2	1			1	2		2
		CO 1	Compute systems.	_	antita	tive asp.	oects o	f waves	and osci	llations i	n engine	ering	3	2						1	2			1
		CO 2	Apply th and iden optical in	tify the	se ph								3	2						1	2			1
PHT 110	ENGINEERING PHYSICS B (FOR NON-CIRCUIT BRANCHES)	CO 3	Analyze the princ in electro	ciples of	quan				mic and s rceive the			0		2						1	2			1
	21111.01207	CO 4	Apply th principle design a	es of acc	oustic	es to exp	plain t	he natu	re and ch	aracteriz			ic 3							1	2			1
		CO 5							t laser an ering app		otic		3	2						1	2			1

									1				
		CO 1	Apply the basic concepts of electrochemistry and corrosion to explore its possible applications in various engineering fields.	1	2	1							
		CO 2	applications.	1	1		1	2					
CYT 100	ENGINEERING CHEMISTRY	CO 3	Apply the knowledge of analytical method for characterizing a chemical mixture or a compound. Understand the basic concept of SEM for surface characterisation of nanomaterials	1	1		1	2					
		CO 4	Learn about the basics of stereochemistry and its application. Apply the knowledge of conducting polymers and advanced polymers in engineering.	2	1								
		CO 5	Study various types of water treatment methods to develop skills for treating wastewater.	1			1			3			
		CO 1	Recall principles and theorems related to rigid body mechanics	2	2								
		CO 2	Identify and describe the components of system of forces acting on the rigid body	3	3								
EST 100	ENGINEERING MECHANICS	CO 3	Apply the conditions of equilibrium to various practical problems involving different force system	3	3								
		CO 4	Choose appropriate theorems, principles or formulae to solve problems of mechanics	3	3								
		CO 5	Solve problems involving rigid bodies, applying the properties of distributed areas and masses	3	3								
		CO 1	Draw the projection of points and lines located in different quadrants	3									
		CO 2	Prepare multiview orthographic projections of objects by visualizing them in different positions	3									

	ENGINEERING	CO 3	Draw sectional views and develop surfaces of a given object	3	1								
EST 110	GRAPHICS	CO 4	Prepare pictorial drawings using the principles of isometric and perspective projections to visualize objects in three dimensions.	3								1	
		CO 5	Convert 3D views to orthographic views	3								2	
		CO 6	Obtain multiview projections and solid models of objects using CAD tools	3			3					3	
		CO 1	Recall the role of civil engineer in society and to relate the various disciplines of Civil Engineering.	3				3	2	2			
		CO 2	Explain different types of buildings, building components, building materials and building construction	3	2					3			
		CO 3	Describe the importance, objectives and principles of surveying.	3	2			2	3		2		
		CO 4	Summarise the basic infrastructure services MEP, HVAC, elevators, escalators and ramps	3	2	1	3				2		
		CO 5	Discuss the Materials, energy systems, water management and environment for green buildings.	3	2		3				2		
EST 120	BASICS OF CIVIL & MECHANICAL ENGINEERING	CO 6	Analyse thermodynamic cycles and calculate its efficiency	3	2		3						
		CO 7	Illustrate the working and features of IC Engines	3	1		3						
		CO 8	Explain the basic principles of Refrigeration and Air Conditioning	3	1								

		CO 9	Describe the working of hydraulic machines	3	2							
		CO 10	Explain the working of power transmission elements	3	1							
		CO 11	Describe the basic manufacturing, metal joining and machining processes	3								
		CO 1	Apply fundamental concepts and circuit laws to solve simple DC electric circuits	3	1							2
		CO 2	Develop and solve models of magnetic circuits	3	1							2
EST 130	BASICS OF ELECTRICAL AND	CO 3	Apply the fundamental laws of electrical engineering to solve simple ac circuits in steady state	3	1							2
231 130	ELECTRONICS ENGINEERING	CO 4	Describe working of a voltage amplifier	2								
		CO 5	Outline the principle of an electronic instrumentation system	2								2
		CO 6	Explain the principle of radio and cellular communication	2								2
		CO 1	Define and Identify different life skills required in personal and professional life				2	1	2	2	1	3
		CO 2	Develop an awareness of the self and apply well-defined techniques to cope with emotions and stress.						3			2
		CO 3	Explain the basic mechanics of effective communication and demonstrate these through presentations.				1		1	3		

HUN 101	LIFE SKILLS	CO 4	Take part in group discussions									3	1
		CO 5	Use appropriate thinking and problem solving techniques to solve new problems		3		2	1					
		CO 6	Understand the basics of teamwork and leadership						1		3		
		CO 1	Compute the derivatives and line integrals of vector functions and learn their applications	3	3	3	3	2	1		1	2	2
		CO 2	Evaluate surface and volume integrals and learn their inter-relations and applications	3	3	3	3	2	1		1	2	2
MAT 102	VECTOR CALCULUS, DIFFERENTIAL EQUATIONS AND TRANSFORMS	CO 3	Solve homogeneous and non-homogeneous linear differential equation with constant coefficients	3	3	3	3	2	1		1	2	2
		CO 4	Compute Laplace transform and apply them to solve ODEs arising in engineering	3	3	3	3	2	1		1	2	2
		CO 5	Determine the Fourier transforms of functions and apply them to solve problems arising in engineering	3	3	3	3	2	1		1	2	2
		CO 1	Develop vocabulary and language skills relevant to engineering as a profession									3	2
		CO 2	Analyze, interpret and effectively summarize a variety of textual content									1	3
HUN 102	PROFESSIONAL	CO 3	Create effective technical presentations						1		1	3	
1011 102	COMMUNICATION	CO 4	Discuss a given technical/non-technical topic in a group setting and arrive at generalizations/consensus									3	1

		CO 5	Identify drawbacks in listening patterns and apply listening techniques for specific needs		1						2	3		
		CO 6	Create professional and technical documents that are clear and adhering to all the necessary conventions	1					1		1	3		
		CO 1	Analyze a computational problem and develop an algorithm/flowchart to find its solution	*	*	*		*				*	*	*
		CO 2	Develop readable* C programs with branching and looping statements, which uses Arithmetic, Logical, Relational or Bitwise operators.	*	*	*	*					*		*
		CO 3	Write readable C programs with arrays, structure or union for storing the data to be processed	*	*	*	*					*		*
EST 102	PROGRAMING IN C	CO 4	Divide a given computational problem into a number of modules and develop a readable multi-function C program by using recursion if required, to find the solution to the computational problem	*	*	*	*					*	*	*
		CO 5	Write readable C programs which use pointers for array processing and parameter passing	*	*		*					*		*
		CO 6	Develop readable C programs with files for reading input and storing output	*	*		*					*		*
		CO 1	Develop analytical/experimental skills and impart prerequisite hands on experience for engineering laboratories	3				3		1	2			1
		CO 2	Understand the need for precise measurement practices for data recording	3				3		1	2			1
PHL 120	ENGINEERING PHYSICS LAB	CO 3	Understand the principle, concept, working and applications of relevant technologies and comparison of results with theoretical calculations	3				3		1	2			1
		CO 4	Analyze the techniques and skills associated with modern scientific tools such as lasers and fiber optics	3				3		1	2			1

		CO 5	Develop basic communication skills through working in groups in performing the laboratory experiments and by interpreting the results	3		3		1	2			1
		CO 1	Understand and practice different techniques of quantitative chemical analysis to generate experimental skills and apply these skills to various analyses	3		2						3
		CO 2	Develop skills relevant to synthesize organic polymers and acquire the practical skill to use TLC for the identification of drugs	3		3						3
CYL 120	ENGINEERING	CO 3	Develop the ability to understand and explain the use of modern spectroscopic techniques for analysing and interpreting the IR spectra and NMR spectra of some organic compounds	3		3						3
CTL 120	CHEMISTRY LAB	CO 4	Acquire the ability to understand, explain and use instrumental techniques for chemical analysis	3		3						3
		CO 5	Learn to design and carry out scientific experiments as well as accurately record and analyze the results of such experiments	3		1						3
		CO 6	Function as a member of a team, communicate effectively and engage in further learning. Also understand how chemistry addresses social, economical and environmental problems and why it is an integral part of curriculum	3		1						3
		CO 1	Name different devices and tools used for civil engineering measurements	1		1	1		2	2		
		CO 2	Explain the use of various tools and devices for various field measurements	1		1	1		2	2		
		CO 3	Demonstrate the steps involved in basic civil engineering activities like plot measurement, setting out operation, evaluating the natural profile of land, plumbing and undertaking simple construction work	1		1	1	2	2	2	1	
ESL 120	CIVIL & MECHANICAL	CO 4	Choose materials and methods required for basic civil engineering activities like field measurements, masonry work and plumbing.	1		1	1	2	2	2	1	1
	WORKSHOP	CO 5	Compare different techniques and devices used in civil engineering measurements	1		1	1		2	2		1

		CO 1	Understa	and the conce	uation.	3	3	3	3	2	1				2		2				
Course code	Course Name		1		Course	outcomes				1	2	3	Pro 4	ogran 5	n Out 6	come 7	s (PO 8	s) 9	10	11	12
	SEMESTER - 3																				
		CO 7	Work in a	a team with go	ood interpe	ersonal skills												3	2		2
		CO 6	Assemble	e and test elec	tronic circi	uits on boards				3				2							1
		CO 5	Draw circ	cuit schematic	s with ED.	A tools				3				2							2
ESL 130	ELECTRICAL & ELECTRONICS WORKSHOP	CO 4	Identify a	nd test variou			3											2			
		CO 3		the connection necessary for			2			1		1		1	2	2		2			
			cables, ba		for electric	cal wiring, electric	cal accesso	ories, wir	es,	2									1		
		CO 1	Demonstr	rate safety me	asures aga	inst electric shock	5								3						1
		CO 8	Apply app trades	propriate safe	ty measure	es with respect to	the mecha	nical wo	kshop	2											
		CO 7	Apply app workshop		ls and Inst	ruments with resp	pect to the	mechani	cal	2											
		CO 6		Basic Mechani and objects	ical worksl	hop operations in	accordan	ce with th	e	1											

		CO 2	Analyse and solve one dimensional wave equation and heat equation.	3	3	3	3	2	1				2		2
MAT201	PARTIAL DIFFERENTIAL EQUATIONS AND COMPLEX ANALYSIS	CO 3	Understand complex functions, its continuity differentiability with the use of CauchyRiemann equations.	3	3	3	3	2	1				2		2
		CO 4	Evaluate complex integrals using Cauchy's integral theorem and Cauchy's integral formula, understand the series expansion of analytic function	3	3	3	3	2	1				2		2
		CO 5	Understand the series expansion of complex function about a singularity and Apply residue theorem to compute several kinds of real integrals.	3	3	3	3	2	1				2		2
		CO 1	problem solving.	2	3		-	-	-	-	-	1	-	-	1
BTT201	BIOPROCESS	CO 2	Solve the material balance and energy balance equations for unit operations and unit processes in bioprocess engineering	2	3	1	-	-	-	-	-	2	-	-	2
D11201	CALCULATIONS	CO 3	Formulate growth medium based on stoichiometry and elemental balances.	2	3	1	-	-	-	-	I	-	-	-	-
		CO 4	Calculate heat of reaction for microbial growth and product formation	2	3	1	-	-	-	-	-	-	-	-	-
		CO 1	microorganisms	-	-	2	2	-	2	2	-	-	-	-	-
		CO 2	Describe the diversity of microorganisms and methods to control their growth	-	-	2	2	-	2	2	-	-	-	-	-
BTT203	MICROBIOLOGY	CO 3	Demonstrate that microorganisms have a vital role in the environment	-	-	2	2	-	3	3	-	-	-	-	-

		CO 4	Cite examples of the vital role of microorganisms in the industries important to human well being.	-	-	2	2	-	3	3	-	-	-	-	-
		CO 1	Compute the fluid properties associated with principles of fluid statics and dynamics of fluid flow.	3	3	-	-	-	2	-	-	-	-	-	2
BTT205	FLUID FLOW AND	CO 2	Use basic momentum and energy balance equations in specific domains of frictional flow/boundary layer flow of incompressible fluids in pipe flow.	3	3	2	-	-	2	-	-	-	-	-	-
B11205	PARTICLE TECHNOLOGY	CO 3	Explore the fluid moving machineries and principles of flow measurement in different flow metering equipments	3	3	2	-	-	2	-	-	-	-	-	2
		CO 4	Examine the equipments for size reduction of solids, particle size analysis methods and solid liquid separation processes	3	3	-	-	-	2	-	-	-	-	-	2
		CO 1	Explain the different concepts and principles involved in design engineering.	2	1					1			1		
EST 200	DESIGN AND ENGINEERING	CO 2	Apply design thinking while learning and practicing engineering.		2				1		1				2
		CO 3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.			2			1	1		2	2		1
		CO 1	Understand the core values that shape the ethical behaviour of a professional.								2			2	
		CO 2	Adopt a good character and follow an ethical life.								2			2	
HUT 200	PROFESSIONAL ETHICS	CO 3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.								3			2	

		CO 4	Solve moral and ethical problems through exploration and assessment by established experiments.								3			2	
		CO 5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.								3			2	
		CO 1	Understand the relevance and the concept of sustainability and the global initiatives in this direction						2	3					2
		CO 2	Explain the different types of environmental pollution problems and their sustainable solutions						2	3					2
MCN201	SUSTAINABLE ENGINEERING	CO 3	Discuss the environmental regulations and standards						2	3					2
		CO 4	Outline the concepts related to conventional and non-conventional energy						2	3					2
		CO 5	Demonstrate the broad perspective of sustainable practices by utilizing engineering knowledge and principles						2	3					2
		CO 1	Demonstrate proper usage, identify the parts/functions of a bright field microscope and visually recognize the microscopic characteristics of bacteria	-	-	2	2	-	1	1	-	3	2	-	-
		CO 2	Apply appropriate laboratory techniques and methodology for isolation, characterization, propagation and enumeration of microorganisms in a given sample	-	-	2	2	-	2	2	-	3	2	-	-
BTL201	MICROBIOLOGY LAB	CO 3	Demonstrate an understanding and appreciation of the impact of microorganisms on agriculture, environment, ecosystem, energy, and human health	-	-	2	2	-	3	3	-	3	2	-	-
		CO 4	Apply appropriate microbiology laboratory techniques, methodologies, instruments and equipment in accordance with current laboratory safety protocol	-	-	-	-	-	1	1	-	3	2	-	-

		CO 1	pressure	e, calibrat	te flow	measuri	ticle size, charac ing equipment, a ts in the laborate	and analy			3	3	-	3	2	-	-	2	2	2	-	-
	FLUID FLOW AND	CO 2					e/interpret data aid statics and k				3	3	-	3	-	-	-	-	-	-	-	-
BTL203	PARTICLE TECHNOLOGY LAB	CO 3	Use mod data in fl				cessary for anal	ysis of th	e experi	mental	3	3	-	3	2	-	-	-	-	-	-	-
		CO 4	ethical a reportin	pproache g	es in ex	perimer	engineering pro ntal investigation vant safety pract	n, collect	on and		3	3	-	3	-	-	-	2	-	-	-	-
	CEMECTER 4																					
Course	SEMESTER - 4													Pr	noran	n Out	come	s (PO	<u>د</u> ا			
code	Course Name				C	ourse o	outcomes				1	2	3	4	5	6	7	8	9	10	11	12
		CO 1	random	variables	S		ties and importa e random pheno		ls of disc	crete	3	2	2	2	2					2		1
		CO 2	random		-		ties and importa			tinuous	3	2	2	2	2					2		1
			variable	ables and,using them, analyse suitable random phenomena orm statistical inferences concerning characteristics of a population d on butes of samples drawn from the population																		
MAT 202	PROBABILITY,STATISTIC S AND NUMERICAL METHODS	CO 3	Perform based or	statistica	al infere	ences co	oncerning charao	teristics		ulation	3	2	2	2	2					2		1
MAT 202	S AND		Perform based on attribute Compute	statistica n es of sam e roots of ation on p	al inferent oples dr	ences co rawn fro ons, eva	oncerning charao	teristics n tegrals a	of a pop		3	2	2	2	2					2		1

		CO 1	Estimate the kinetics for chemical and biological reactions	3	2	3	-	2	2	1	-	-	-	-	-
BTT202	CHEMICAL AND BIOLOGICAL REACTION	CO 2	Analyze the performance of Batch and Continuous reactors and recommend modifications for improvement	3	2	2	1	-	3	3	-	-	-	-	-
611202	ENGINEERING	CO 3	Predict the conversion for ideal and non-ideal reactors	3	2	2	2	-	2	2	-	-	-	-	-
		CO 4	Explain the nature of catalytic reactions with regard to the multiple steps of mass transfer and surface reaction and the concept of rate limiting step	3	2	1	1	-	3	3	-	-	-	-	-
		CO 1	Describe the role of cellular chemicals and their functions.	3	-	3	2	-	3	-	-	-	-	-	2
BTT204	PRINCIPLES OF	CO 2	Describe biosynthetic pathways and understand the key aspects of metabolism.	3	-	3	2	-	3	-	-	-	-	-	2
Б11204	BIOCHEMISTRY	CO 3	Explain cellular energy requirements and how energy is utilized by a cell.	3	-	3	2	-	2	-	-	-	-	-	2
		CO 4	Understand the behaviour of enzymes and their kinetics.	3	-	3	2	-	2	-	-	-	-	-	2
BTT206	BIOPROCESS ENGINEERING	CO 1	Illustrate the isolation and preservation of microorganism and development of inoculums.	-	-	3	-	-	-	3	-	-	3	-	3
		CO 2	Summarize medium and air sterilization methods	-	-	3	-	-	-	-	2	-	3	-	3
		CO 3	Elucidate the mass transfer effects in bioreactors	-	-	-	-	-	-	-	-	-	3	-	-

		CO 4	Outline bioreactor scale up and scale down procedures	3	-	3	-	-	-	-	-	-	3	-	3
		CO 1	Explain the different concepts and principles involved in design engineering.	2	1					1			1		
EST 200	DESIGN AND ENGINEERING	CO 2	Apply design thinking while learning and practicing engineering		2				1		1				2
		CO 3	Develop innovative, reliable, sustainable and economically viable designs incorporating knowledge in engineering.			2			1	1		2	2		1
		CO 1	Understand the core values that shape the ethical behaviour of a professional.								2			2	
		CO 2	Adopt a good character and follow an ethical life.								2			2	
HUT 200	PROFESSIONAL ETHICS	CO 3	Explain the role and responsibility in technological development by keeping personal ethics and legal ethics.								3			2	
		CO 4	Solve moral and ethical problems through exploration and assessment by established experiments.								3			2	
		CO 5	Apply the knowledge of human values and social values to contemporary ethical values and global issues.								3			2	
		CO 1	Explain the background of the present constitution of India and features						2	2	2		2		
		CO 2	Utilize the fundamental rights and duties.						3	3	3		3		

		Understand the working of the state executive, legislature and judiciary. Utilize the special provisions and statutory institutions.						3	2	2				
-	CO 5	Utilize the special provisions and statutory institutions.						-	2	3		3		
								3	2	3		3		
	CO 6	Show national and patriotic spirit as responsible citizens of the country						3	3	3		2		
	CO 1	Prepare reagents for various biochemistry experiments.	-	-	-	1	-	-	1	-	3	2	-	3
	CO 2	Qualitative and quantitative analysis of various biomolecules	-	-	-	1	-	-	1	-	3	2	-	3
	CO 3	Perform enzyme isolation, estimation and assay	-	-	-	1	-	-	1	-	3	2	-	3
	CO 4	Use some basic analytical instruments like spectrophotometer	-	-	-	1	-	-	1	-	3	2	-	3
			-	-	3	2	-	-	-	-	3	2	-	-
ANALYTICAL ECHNIQUES IN ECHNOLOGY LAB	CO 2	Critically evaluate the strengths and limitations of the individual analytical techniques with respect to selectivity and sensitivity for solving bioengineering problems.	-	-	2	2	-	-	-	-	3	2	-	-
		Possess and be capable of applying a knowledge of modern analytical techniques.	-	-	2	2	2	-	_	_	2	2	_	
41 EC	HEMISTRY LAB	CO 3 CO 4 CO 1 NALYTICAL CHNIQUES IN	HEMISTRY LAB C0 2 Lemistry LAB C0 3 Perform enzyme isolation, estimation and assay C0 4 Use some basic analytical instruments like spectrophotometer C0 4 Use some basic analytical instruments like spectrophotometer C0 1 Capability to perform and develop knowledge for the appropriate selection of instruments for the successful analysis of biomolecules. NALYTICAL C0 1 Critically evaluate the strengths and limitations of the individual analytical techniques with respect to selectivity and sensitivity for solving bioengineering problems. Possess and be capable of applying a knowledge of modern analytical	HEMISTRY LAB C0 2 - C0 3 Perform enzyme isolation, estimation and assay - C0 4 Use some basic analytical instruments like spectrophotometer - C0 4 Use some basic analytical instruments like spectrophotometer - RALYTICAL C0 1 Capability to perform and develop knowledge for the appropriate selection of instruments for the successful analysis of biomolecules. - NALYTICAL C0 1 Critically evaluate the strengths and limitations of the individual analytical techniques with respect to selectivity and sensitivity for solving bioengineering problems. - Possess and be capable of applying a knowledge of modern analytical -	HEMISTRY LABC0 2Perform enzyme isolation, estimation and assayC0 3Perform enzyme isolation, estimation and assayC0 4Use some basic analytical instruments like spectrophotometerC0 4Use some basic analytical instruments like spectrophotometerC0 1Capability to perform and develop knowledge for the appropriate selection of instruments for the successful analysis of biomoleculesNALYTICAL CHNIQUES IN CHNOLOGY LABC0 2Critically evaluate the strengths and limitations of the individual analytical techniques with respect to selectivity and sensitivity for solving bioengineering problemsPossess and be capable of applying a knowledge of modern analytical	HEMISTRY LABCO 2Perform enzyme isolation, estimation and assayCO 3Perform enzyme isolation, estimation and assayCO 4Use some basic analytical instruments like spectrophotometerCO 4Use some basic analytical instruments like spectrophotometerCO 1Capability to perform and develop knowledge for the appropriate selection of instruments for the successful analysis of biomolecules3NALYTICAL CHNIQUES IN CHNOLOGY LABCO 2Critically evaluate the strengths and limitations of the individual analytical techniques with respect to selectivity and sensitivity for solving bioengineering problems2Possess and be capable of applying a knowledge of modern analytical2	HEMISTRY LAB $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	HEMISTRY LAB $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	HEMISTRY LAB $\begin{array}{c ccccccccccccccccccccccccccccccccccc$	HEMISTRY LAB $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	HEMISTRY LAB $\begin{array}{c ccccccccccccccccccccccccccccccccccc$	HEMISTRY LAB $ \begin{array}{c ccccccccccccccccccccccccccccccccccc$	HEMISTRY LAB $\begin{array}{c c c c c c c c c c c c c c c c c c c $	HEMISTRY LAB $\begin{array}{c c c c c c c c c c c c c c c c c c c $

	SEMESTER - 5																						
Course code	Course Name				(Course o	outcome	es				1	2	3	Pro 4	ogran 5	n Out 6	come 7	s (PO 8	s) 9	10	11	12
couc		CO 1	Appreci commo		use of m	icroorga	inisms fo	or the pr	oductior	n of value	e-added	2	-	-	-	-	-	-	-	-	2	-	-
	INDUSTRIAL	CO 2	Describ recently			bioproce	esses, fro	om the t	raditiona	al to the		3	-	-	-	-	-	-	-	-	-	3	-
BTT301	BIOPROCESS TECHNOLOGY	CO 3	Unders product						ciples in	volved in	ı the	2	-	-	-	-	-	-	3	-	-	3	-
		CO 4	Summai	rize the	Market	economi	ics in the	e produc	tion of a	bio prod	uct	3	-	-	-		-	-	-	-	2		-
		CO 1	Identify equation		chanism	ns of mas	ss transf	er and fo	ormulate	the rate		3	2	3	2	-	2	2	-	-	-	-	2
DTTOO	MASS TRANSFER	CO 2	Select si	uitable s	separatio	on equip	ment fo	r a given	separat	ion		3	2	3	2	-	2	2	-	-	-	-	-
BTT303	OPERATIONS	CO 3	Apply m operatio		and ene	rgy balaı	nce to de	etermine	e differer	it mass t	ransfer	2	2	3	-	-	2	2	-	-	-	-	-
		CO 4	Design o	different	t extract	ion and	drying o	peratior	15			2	2	3	-	-	2	2	-	-	-	-	-
		CO 1	acids di	scrimina	ate betw	een ther	n			istry of n		2	-	-	2	-	-	-	-	-	-	-	-
		CO 2	Evaluat translat explain	ion and		etween o	of DNA r	eplicatio	on, transo	cription a	and	3	2	3	2	-	-	-	-	-	-	-	-

BTT305	MOLECULAR BIOLOGY	CO 3	Understand the basic mechanisms involved in mutagenesis	2	3	2	3	-	-	-	-	-	-	-	-
		CO 4	Articulate the role of gene organization and gene regulation in prokaryotes and eukaryotes	3	2	2	2	-	-	-	-	-	-	-	-
		CO 1	Apply the laws of thermodynamics on biochemical reactions	3	2	2	2	-	2	2	-	-	-	-	-
077207	THERMODYNAMICS AND	CO 2	Comprehend the basic principles involved in the mechanism of heat transfer	3	2	2	2	-	2	2	-	-	-	-	-
BTT307	HEATTRANSFER	CO 3	Evaluate the rate of heat transfer and area of heat transfer	3	3	2	3	-	3	2	-	-	-	-	-
		CO 4	Analyze the performance of heat exchange equipments	3	3	2	3	-	3	3	-	-	-	-	-
		CO 1	Define and use various terminologies in use in disaster management parlance and organise each of these terms in relation to the disaster management cycle (Cognitive knowledge level		2				2				2		2
		CO 2	Distinguish between different hazard types and vulnerability types and do vulnerability assessment (Cognitive knowledge level	2	3	2		2	2	3			3		2
MCN 301	DISASTER	CO 3	Identify the components and describe the process of risk assessment, and apply appropriate methodologies to assess risk (Cognitive knowledge level	2	3	2	2	2	2	3			3		2
1.014 301	MANAGEMENT	CO 4	Explain the core elements and phases of Disaster Risk Management and develop possible measures to reduce disaster risks across sector and community (Cognitive	3	3	3		2	2	3					2
		CO 5	Identify factors that determine the nature of disaster response and discuss the various disaster response actions (Cognitive knowledge level:	3	3			2	2	3					2

		CO 6	Explain the various legislations and best practices for disaster management and risk reduction at national and international level (Cognitive knowledge level	3					2	3	3				2
		CO 1	Explain the characteristics of management in the contemporary context	2				1	2	2	2		2	1	1
		CO 2	Describe the functions of management	2				1	1		2	1	2	1	1
HUT 310	MANAGEMENT OF ENGINEERS	CO 3	Demonstrate ability in decision making process and productivity analysis	2	2	2	2	1							
1101 510	ENGINEERS	CO 4	Illustrate project management technique and develop a project schedule	2	2	2	2	1						2	1
		CO 5	Summarize the functional areas of management	2					1	1		1	2	1	
		CO 6	Comprehend the concept of entrepreneurship and create business plans		2	2	2	1	1	1	1	1	1	1	1
		CO 1	Development of an ability to design and conduct bioprocess experiments as well as to analyze and interpret data.	3	3	-	3	2	-	-	3	3	3	3	-
	BIOPROCESS	CO 2	Calculate the kinetic parameters of enzymatic reactions as well as microbial growth	3	3	-	3	-	-	-	-	-	-	-	-
BTL331	ENGINEERING LAB	CO 3	Development of research attitude and technical skills to secure a job in bioprocess labs.	3	3	-	3	2	-	-	3	3	3	-	3
		CO 4	exhibit ethical principles in the engineering profession by practicing ethical approaches in experimental investigation, collection and reporting of data and adhering to the relevant safety practices in the laboratory.	3	3	-	3	-	-	-	3	-	-	3	-

		CO 1	behind	the im	portant t	echniqu	understanding o es in molecular b	oiology.	· -	S	3	3	-	3	2	-	-	-	3	3	-	-
BTL333	MOLECULAR BIOLOGY	CO 2	technic			underst	anding the appli	cations o	of the		3	3	-	3	2	-	-	-	3	3	-	-
BIL333	LAB	CO 3	perfori	ned.			ts of the laborato				-	-	-	2	-	-	-	-	3	3	3	2
		CO 4	precau	t the awa tions in o rgency.		of the ha	zardous chemica	ils and sa	afety		-	-	-	3	-	3	3	2	3	3	-	-
	SEMESTER - 6																					
Course							_							Pr	ograr	n Out	come	s (PO	s)			
code	Course Name				(Lourse o	outcomes				1	2	3	4	5	6	7	8	9	10	11	12
		CO 1	Differe	entiate va	arious bi	ological	databases.				-	-	-		3	-	-	-	-	-	-	-
		CO 2	Infer tł	ne termir	ologies	and cond	cepts in the field.				-	-	2	2	2	-	-	-	-	-	2	2
BTT302	BIOINFORMATICS	CO 3	Genera scoring matrice	5	iterpret	the sequ	ence alignment a	and impl	ement t	16	-	-	2	2	2	-	-	-	-	-	2	-
		CO 4					matics tools.				-	-	2	2	3	2	-	-	-	-	2	2
		CO 1	downs	tream	-		erlie major unit nd biopharmace	-	ns used	in	-	-	3	2	-	2	-	-	-	-	-	-
		CO 2	Define produc		y out sej	paration	and purification	of ferm	entation		-	-	2	2	-	2	-	-	-	-	-	-

	DOWNSTREAM	CO 3	Integrate biological and engineering principles involved in the production and recovery of commercial products.	-	-	3	2	-	2	-	-	-	-	2	-
BTT304	PROCESSING	CO 4	Design and formulate effective strategies of downstream processing based on characteristics of biomolecules	-	-	3	3	3	2	-	-	-	-	2	-
		C05	Analyse the quality and characteristics of the purified product	-	-	2	2	-	2	-	-	-	-	-	-
		C06	Demonstrate the suitable downstream approaches comprising of new concepts and emerging technologies	-	-	3	3	3	2	-	-	-	-	-	-
		CO 1	Elucidate all relevant terms related to conventional process control	3	2	2	2	-	-	-	-	-	-	-	-
BTT306	BIOREACTOR CONTROL AND	CO 2	Model simple systems and solve the mathematical equations using Laplace transforms	3	2	2	2	-	-	-	-	-	-	-	-
D11300	INSTRUMENTATION	CO 3	Explain the various sensors in bioreactors	3	3	-	-	-	-	-	-	-	-	-	-
		CO 4	Analyze the stability of open loop and closed loop systems and tune the controller	3	3	2	3	-	-	-	-	-	-	-	-
		CO 1	Disseminate and inculcate knowledge of various plant and animal tissue culture techniques.	-	-	-	-	-	2	3	2	-	-	-	3
BTT312	PROGRAM ELECTIVE I ANIMAL & PLANT CELL	CO 2	Analyse different medias for cell culture.	-	-	-	-	-	2	3	2	-	-	-	3
511512	TECHNOLOGY	CO 3	Integrate biological and engineering principles in gene transfer methods	-	-	-	-	-	2	3	2	-	-	-	3

		CO 4	Appraise the aspectsof various products obtained through cell culture technologies."	-	-	-	-	-	2	3	2	-	-	-	3
		CO 1	Explain the problem of scarcity of resources and consumer behaviour, and to evaluate the impact of government policies on the general economic welfare	2										3	
		CO 2	Take appropriate decisions regarding volume of output and to evaluate the social cost of production.	2	2			2	2	3				3	
HUT 300	INDUSTRIAL ECONOMICS & FOREIGN TRADE	CO 3	Determine the functional requirement of a firm under various competitive conditions.	2	2	1								3	
		CO 4	Examine the overall performance of the economy, and the regulation of economic fluctuations and its impact on various sections in the society.	2	2	1			1					3	
		CO 5	Determine the impact of changes in global economic policies on the business opportunities of a firm	2	2	1								3	
		C01	Confidently prepare for competitive examinations in Biotechnology Engineering like GATE.	2	1				2						
DTT200	COMPREHENSIVE	CO2	Comprehend the core principles and technologies in Biotechnology Engineering and answer multiple choice questions based on them with confidence	3	2		1		2				2		1
BTT308	COURSE WORK 1	CO3	Communicate effectively with scientists and faculties in an academic environment.	2	1				2				3		
		CO4	Relate and analyze the comprehensive knowledge gained by him/her in the core courses to the field of Biotechnology Engineering	3	3		1	1	2						2
		C01	To strengthen fundamental understanding of the unit operations involved in the separation and purification of a biological product.	-	3	-	3	2	-	-	2	2	2	-	-

		CO 3		ansfer e			s distillation colu				3	3	3	2	-	-	1	-	1	-	-	-
BTT401	PROCESS EQUIPMENT AND PLANT DESIGN	CO 2	heat tr conden Calcula	ansfer e sers. te the di	quipmer fferent p	nt such as	ers associated w s heat exchanger ers associated wi	rs, evapo	orators a	nd esign of	3	3	3	2	1	-	1	-	1	-	-	-
		CO 1	Illustra plant Safety.	te the ba	asics of p	orocess p	lant design, flow	/ sheetin	g, P & ID	and	2	2	2	2	1	2	2	-	-	-	-	-
Course code	Course Name					Course o	outcomes				1	2	3	Pro 4	ogran 5	n Out 6	come 7	s (PO 8	s) 9	10	11	12
	SEMESTER - 7																					
		CO 4	Analyz	e perfor	mance o	f various	s heat transfer eo	quipmen	it		2	2	2	-	-	2	-	2	3	3	-	2
51050 f	TRANSFER LAB	CO 3	Identif	y suitabl	le equipi	ment for	the given separa	ation			2	2	2	-	-	2	-	2	3	3	-	2
BTL334	HEAT AND MASS	CO 2	Analyz	e the tra	insport p	processes	s and equipment	t			2	2	2	-	-	-	-	2	3	3	-	2
		CO 1	Identif	ication c	of transp	ort prop	erties of liquids	and gase	es		3	2	2	-	-	-	-	2	3	2	-	2
		CO4				iochemio products	cal engineering r	reactions	s along w	rith		3	-	3	-	-	-	2	-	-	-	-
BTL332	PROCESSING LAB	CO3	Unders purifica		hniques	of bulk	product / prote	in isolati	ion and		2	3	-	3	2	-	-	-	-	-	-	-
	DOWNSTREAM	CO2	Learn v	various c	ell disru	ption tec	chniques.				-	3	-	3	-	-	-	-	-	-	-	-

		CO 4	Calculate the different parameters associated with the process design of bioreactors and the mechanical design of pressure vessels.	3	3	3	3	1	-	1	-	1	-	-	-
		C01	Demonstrate different tools in genetic engineering and strategic approaches for cloning and expression of DNA molecules	2				3		1					
D		CO2	Illustrate the design and constitution of DNA Cloning Vectors and methodologies involved	2	3			1		2					
BTT423	GENETIC ENGINEERING	CO3	Apply the principles of various molecular mechanisms for the genomic and proteomic analysis	2	2	2		2	2	2					
		CO4	Evaluate the implementation of genetic engineering principles in gene sequencing, silencing, editing, recombinant protein production and transgenics.	2	3			3	3	3	2				
		C01:	Use the basic principles of Chemical Reaction Engineering and Process Control to find kinetics of Chemical reaction and responses of process control systems by performing experiments	2											
		CO2	Design experiments and interpret data collected from experimental investigations		2		2								
BTL411	REACTION ENGINEERING AND	CO3	Use modern computing tools necessary for analysis of the experimental data					2							
DIL411	PROCESS CONTROL LAB	C04	Practice ethical approaches in experimental investigation, collection and reporting of data and adhering to the safety ethics set by the laboratory.								2				
		C05	Practice work in diverse groups and perform laboratory experiments.									2			
		C06	Communicate through oral and writing skills through viva and preparing reports of experimental work."										2		

code											1	2	3	4	5	6	7	8	9	10	11	12
Course	Course Name				(Course	outcomes							Pro			come		-			
SEMEST	ER 8																					
		C05	reports"								2	3	3	1	2							1
			Commu	nicate t	echnical	linforma	ition by means of	f written	and ora	1		2	2	1	2							1
		CO4	Validate	e the res	ults by t	theoretio	cal and experime	ental mea	ans.						2			3	2	2	3	2
BTD415	PROJECT PHASE I	CO3	Analyze	e and int	erpret t	he resul	ts obtained.												3	2	2	1
		CO2	Prepare schedule		lan, liai:	son with	the team and co	mplete t	he task a	s per	2	2	2		1	3	3	1	1		1	1
		C01	Identify their sol		thesize	problem	is, and propose tl	he meth	odology	for	2	2	2	1	2	2	2	1	1	1	1	2
		CO 5					ing in discussion ating in discussio				3	3	3	3	2	2		2		3		3
		CO 4	Apply sł	cill in ex	ploring	the data	sources.				3				2			1		3		3
BTQ413	SEMINAR	CO 3	Develor	o oral an	d writte	en comm	unication skill ar	nd confid	dence lev	rel.	3	2			3			1		2		3
l		CO 2	Develop technica			terature	survey, report p	reparati	on and		3	3	2	3		2	1					3
		CO 1	Identify	the cur	rent top	oics of pr	ofessional intere	est.			2	2	1	1		2	1					3

BTT402		CO 1 Articulate the role of microorganisms in preventing and abating environmental pollution	-	-	-	2	-	3	3	-	-	-	-	2	
	ENVIRONMENTAL	CO 2	Identify and analyze the common pathways in removal and detoxification of pollutants.	-	-	-	2	-	3	3	-	-	-	-	2
	BIOTECHNOLOGY	CO 3	Construct important energy reactions in waste degradation.	-		-	2	-	3	3	-	-	-	-	2
		CO 4	Identify the source of BOD in wastewater and its determination and also set up different types of biofilm processes	-	-	-	2	-	3	3	-	-	-	-	2
BTT414		C01	Understand the different physicochemical properties of food.	2											
	FOOD PROCESS	CO2	Analyze the theory and application of unit operations in food processing	3	3 2 2 1 2 2	1	2								
	TECHNOLOGY	CO3	Describe microbial food spoilage and factors involved.	1				2							
		CO4	Demonstrate various food processing and preservation techniques and the equipments used.	2		2	1	2							2
		CO 1	Describe the theories of accident causation and preventive measures of industrial accidents.	2	2				2	2	2				1
		CO 2	Explain about personal protective equipment, its selection, safety performance & indicators and importance of housekeeping.	2	1	2		1	1	1	1				1
	INDUSTRIAL SAFETY ENGINEERING	CO 3	Explain different issues in construction industries.	2	2	2		1	1	1	1	1	1		1

		CO 4	Describe various hazards associated with different machines and mechanical material handling.	2	2	2		1	1	1	1	1	1		1
		CO 5	Utilise different hazard identification tools in different industries with the knowledge of different types of chemical hazards.	2	2	2	1	1	1	1	1	1	1		1
BTT436		C01	Understand the properties, uses and limitations of materials and devices to repair, replace or augment living tissues and organs of the human body.	2											
	BIOMATERIALS , TISSUE ENGINEERING & STEM CELLS	CO2	Assimilate the key biological and engineering principles underlying biomaterials science and tissue engineering.	3											
		CO3	Examine the scientific, technological, social and ethical issues involved in the clinical implementation of tissue engineering.	2					3		3				
		C01	Explain general considerations in quality of bioproducts	2				2	2		1				
		CO2	Explain quality assurance and quality management.	2						3	2			2	
BTT458	BIOPROCESS QUALITY CONTROL	CO3	Explain the working principle and application of instruments used in process validation	2		3	2	2	2	2	2				
		CO4	Explain the food laws and regulations in India	3											2
		C05	Explain the need for biosafety and safe practices"	2	2	2					2				
		C01	Examine the knowledge acquired in the core courses in Biotechnology Engineering/Biotechnology & Biochemical Engineering degree.	3											

BTT404	COMPREHENSIVE	C02	Develop confidence to appear for any competitive and/or other examinations and to face interviews.	3	3								3		
	COURSE VIVA	CO3	Communicate the views clearly and precisely with anyone in scholarly environments	3									3		
		CO4	Apply the comprehensive knowledge gained in core courses in understanding engineering problems relevant to the society"	3	2				3						
		C01	Identify and synthesize problems and propose the methodology for their solution.	2	2	2	1	2	2	2	1	1	1	1	2
		CO2	Prepare work plan, liaison with the team and complete the task as per schedule.	2	2	2		1	3	3	1	1		1	1
		CO3	Analyze and interpret the results obtained.								3	2	2	1	
BTD416	PROJECT PHASE II	CO4	Organize the results of theoretical and/or experimental means for validation.				2			3	2	2	3	2	
		C05	Demonstrate skill to communicate technical information by means of written and oral reports.	2	3	3	1	2							1
		C06	Organize and communicate technical and scientific findings effectively in written and oral forms (Cognitive knowledge level: Apply).					2			2	2	3	1	1