K L UNIVERSITY

DEPARTMENT OF COMMERCE

ACADEMIC YEAR 2013-14

UNIVERSITY VISION AND MISSION

Vision

To be a globally renowned university.

Mission :

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

DEPARTMENT OF COMMERCE VISION AND MISSION

Vision:-

To be a center for excellence and globally competitive in the core arias of accounting and finance.

Mission:-

1. To be involved in consultancy services in the arias of accounting, finance and taxation.

2. After examining the current need of the market the department is actively focusing on Summer internship and industrial training.

3. To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and responsible citizens with intrinsic values.

PEO'S

1 To produce best commerce (H) graduates in the country as well as in Global
2. To equip students with updated inputs in the field of accounting and finance
3. To provide practical explore as per corporate needs through summer intern ship and industrial training.

Program outcomes: -

PO1	An ability to apply knowledge of Accounting, Finance and Taxation
PO2	An ability to develop each graduate to be adept in identifying and understanding major commerce trends both locally and globally
PO3	An ability to develop each graduate to be a critical thinker and strong decision maker.
PO4	An ability to develop each graduate to be an effective and professional communicator.
PO5	An understanding of professional and ethical responsibility
PO6	Knowledge of contemporary issues.
PO7	A recognition of the need for and an ability to engage in life-long learning

PO-MISSION MAPPING

S.No	Description of PEOs	Key Components of Mission		
		M 1	M 2	M 3
		To be involved in consultancy services in the arias of accounting, finance and taxation	After examining the current need of the market the department is actively focusing on Summer internship and industrial training.	To impart quality higher education and to undertake research
PEO 1	To produce best commerce (H) graduates in the country as well as in Global	.	.✓	.✓
PEO 2	To equip students with updated inputs in the field of accounting and finance		✓	✓
PEO 3	To provide practical explore as per corporate needs through summer intern ship and industrial training.	✓		✓

PO		PEO		
		1	2	3
		To produce best commerce (H) graduates in the country as well as	To equip students with updated inputs in the field of accounting and	To provide practical explore as per corporate needs through summer
1	An ability to apply knowledge of Accounting, Finance and Taxation	YES	YES	YES
2	An ability to develop each graduate to be adept in identifying and understanding major commerce trends both	YES	YES	YES
3	An ability to develop each graduate to be a critical thinker and strong decision maker.	YES	YES	YES
4	An ability to develop each graduate to be an effective and professional communicator.	YES	YES	YES
5	An understanding of professional and ethical responsibility	YES	YES	YES
6	Knowledge of contemporary	YES	YES	YES
7	A recognition of the need for and an ability to engage in life-long	YES	YES	YES

K L UNIVESITY

DEPARTMENT OF COMMERCE

Course Code	Course Title2	S NO	CO NO	Description of the Course Outcome	1	2	3	4	5	6	7
11BC11K0	English Language Skills - I	1	CO1	At the end of the course the learners will be able to understand the meanings of words from context,				2			2
			CO2	Develop different reading skills,				2			2
			CO3	Write different types of office communication				2			2
			CO4	Respond effectively to cultural communication differences.				1			2
11BC11C1	Principles of Accounting	2	CO1	Understand the fundamentals of accounting for bills of exchange.	3	1			1		
			CO2	Know about consignment and joint venture accounts.	3	1			1		
			CO3	Have knowledge in accounting of non-trading concerns.	3	1			1		
			CO4	Acquaint with accounting knowledge in partnership accounting.	3	1			1		
11BC11C2	Indian Business Environment	3	CO1	To study the current economic practices.		2				2	
			CO2	To understand the business trends at the micro and macro level		2				1	
			CO3	To have the complete knowledge of Government business polcies		2	1			1	
			CO4	To be an independent future entrepreneur		2	1			1	
11BC11C3	Business Mathematics	4	CO1	Understand basic knowledge of Matrix algebra for Business.			2				
			CO2	Have knowledge about Fundamental of Functions in Business.			2		2		
			CO3	Basic concept of Derivatives in Business.			2			2	

			CO4	Basic knowledge with introduction for financial Mathematics for Business.	2		2				
11BC11C4	Business Economics	5	CO1	Understand the various concepts relating to Nation Income and Different methods of measuring national income.	2	1	1				
			CO2	Have knowledge in theories of employment and consumption function.	2	1	1				
			CO3	Have applied knowledge in money and banking to exercise the monetary control.	2		1	1			
			CO4	Acquaint with various phases of business cycles, Government budgets and fiscal policy of the Government	2			2			
11BC11K5	Introduction to Information Technology	6	CO1	To know about the fundamentals of computers					2		2
			CO2	To study the operating system skills		1					2
			CO3	To practice basics of MS-OFFICE an words							2
			CO4	To prepare the spread and excel sheet for recording keeping			1		5		
11BC11K6	Contemporary India*	7	CO1	To about the Indian culture and values			1			2	
			CO2	To develop in understanding Indian History			1			2	
			CO3	To learn the ethical values by the great people					2	1	
11BC21C0	Advanced Financial Accounting	8	CO1	To understand single entry system of accounting	3	2			2		
			CO2	Acquaint with the accounting procedure of Royalty	3	1			2		
			CO3	Know about the procedure of hire purchase and installment system..	3	2			2		
			CO4	Capable of dealing with insolvency and fire claims	3	2			2		
11BC21C1	Systems and Special	9	CO1	To understand the basic principles of auditing	2	2			2		
			CO2	To gain knowledge on various powers and rights and duties of	2	2			2		

	Auditing			auditors							
			CO3	To understand the procedure for exceptional audit practices	2	2			2		
			CO4	To streamline the procedure and practice of maintaining books of accounts	2	2			2		
11BC21C2	Banking Law and Practice	10	CO1	To know the history and evaluation of banking industry in India	2	2			2		
			CO2	To understand the legal aspects of banking operations.	2	2			1		
			CO3	To gain knowledge about special banking regulations and laws	2	2			1		
			CO4	To learn application of commercial laws in banking practice	2	2			1		
11BC21C3	Management Accounting	11	CO1	To understand the need of management accounting and statement analysis	2		2		1		
			CO2	To know the preparation of cash flow statement	2		2		1		
			CO3	To know preparation of funds flow statement	2		2		1		
			CO4	To learn the basics of ratio analysis	2		2		1		
11BC21K4	Direct Taxes – I	12	CO1	to know the basics of income tax	2				1		2
			CO2	To understand the treatment of agricultural income	2	1			1		2
			CO3	To gain knowledge about residential status and incidence of tax	2	1			1		2
			CO4	To gain knowledge to compute income under five heads	2	2			1		2
11BC21C5	Marketing Management	13	CO1	To understand basics of marketing principles			1				
			CO2	To elaborate different functional areas of marketing			1				
			CO3	To make an analysis of market testing and segment analysis			1			2	
			CO4	To gain practical exposure in marketing practices			1			2	

11BC21K6	Corporate and Allied Laws	14	CO1	Understand companies Act-2013 and company management		1	2		1		
			CO2	C2: Have knowledge in regulation of competition Act.		1	2		1		
			CO3	C3: Gain knowledge in regulation and management of foreign exchange.		1	2		1		
			CO4	C4: Acquaint with information technology Act.		1	2		1		
11BC41C0	Capital Markets (CM)	15	CO1	To understand the basics inputs of financial markets	2	1	1				
			CO2	To know the role of capital market in Indian economy	2	1	1				
			CO3	To understand the practices of capital market practices in India	2	1	1				
			CO4	To know the implications of Indian capital market at Global level	2	1	1				
11BC41C1	International Financial Management	16	CO1	To get an exposure to Global transactions	1		1				
			CO2	To determine the standards of Global exchange rates	1	2	1				
			CO3	To determine the convertible values of the currencies	2	2	1				
			CO4	To understand ease of doing business through international Financial management.	2	2	2				
11BC41C2	Security Analysis and Portfolio Management	17	CO1	To understand the meaning investment and investors investment avenues and preferences.	2	2	2		1		1
			CO2	To know about risk and return on investment	2	2	2		1		
			CO3	To divide the portfolio basing on risk factors.	2	2	2		1		1
			CO4	To determine portfolio selection	2	2	2		1		1
11BC41C3	Commerce Lab-II (Taxation)	18	CO1	Understand clubbing of income and set off and carry forward of losses.	2	1					
			CO2	Have knowledge about assessment of an individual.	2	1					
			CO3	Gain knowledge in computation of income of firm.	2	1					
			CO4	Acquaint with powers of income tax authorities.	1	1					
11BC41k4	Soft Skills Lab-II	19	CO1	Apply concepts of critical and analytical reading skills,				2			2

			CO2	analyse topics and situations and apply strategies of group discussion,			1	2			2
			CO3	apply effective communication techniques in everyday conversations and				2			2
			CO4	Understand and apply the procedures of technical writing.			1	2			2
11BC41Z4	International Financial Reporting standards	20	CO1	To understand Indian accounting standards	2		2		2		
			CO2	To understand IASB and functions	2		2		2		
			CO3	To understand US GAAP	2		2		2		
			CO4	Compare and distinguish IAS, AS and US GAAP	2		2		2		
1*1BC41*Q0	Corporate Tax Planning and Management (CTPM	21	CO1	Understand the Corporate taxes & planning	2	1	1		2		
			CO2	Understand the various deductions under section 80	2	1	1		2		
			CO3	Understand the exemptions from taxes	2	1	1		2		
			CO4	Understand the tax evasion and tax avoidance.	2	1	1		2		
11BC12K0	English Language Skills - II	22	CO1	To understand Memo Writing, Note Making, Note Making, Paraphrasing			2				1
			CO2	To understand Short Story, Poem, Drama				2			1
			CO3	To understand Corporate Dressing, First Impression, Grooming					2		1
			CO4	Explain your favorite dish, Conversation at a dinner				2			1
11BC12C1	Financial Accounting	23	CO1	To understand the fundamental of accounting for bills of exchange	2	1	2		1		
			CO2	To know about consignment and joint venture accounts	2	1	2		1		
			CO3	To have complete knowledge in accounting of no-trading concerns	2	1	2		1		
			CO4	To acquaint with accounting knowledge in partnership accounting	2	1	2		1		

11BC12C2	International Business Environment	24	CO1	To get exposure to global business environment	2		2				
			CO2	To know the types of global business standards	2		2				
			CO3	To understand the importance of export import business	2		2				
			CO4	To understand global receipts and payments of transactions.	2		2				
11BC12C3	Quantitative Methods	25	CO1	To determine various techniques of production activities	2		2		1		
			CO2	To determine effective tools and techniques	2		2		1		
			CO3	To estimate the variables in determine the values	2		2		1		
			CO4	To know the effectiveness of the outcome of the results.	2		3		2		
11BC12C4	Monetary Economics	26	CO1	Understand the various concepts relating to National Income and Different methods of measuring national income.	2	1	1				
			CO2	Have knowledge in theories of employment and consumption function.	2	1	1				
			CO3	Have applied knowledge in money and banking to exercise the monetary control.	1	2	1				
			CO4	Acquaint with various phases of business cycles, Government budgets and fiscal policy of the Government	2	1	2				
11BC12K5	Business Laws	27	CO1	To understand the basics of business laws		2	1		1		
			CO2	To understand the contract act and its essential conditions		2	2		1		
			CO3	To understand the bailment and pledge		2	1		1		
			CO4	To understand the companies act 2013		2	2		1		
11BC12K6	Accounting Packages	28	CO1	Understand the fundamentals of computerized accounting.	2		1				
			CO2	Know about tally basics.	2		2				2
			CO3	Have knowledge in accounting vouchers.	2						2

			CO4	Acquaint with knowledge in inventory accounting.	2		2				
11BC22C0	Corporate Accounting	29	CO1	Understand the fundamentals of corporate accounting.	2		2				
			CO2	Know about tally basics.	2		2				
			CO3	Have knowledge in accounting vouchers.	2		2				
			CO4	Acquaint with knowledge in inventory accounting.	1		2				
			CO5	Understand the fundamentals of computerized accounting.	1	2	1				
11BC22C1	Auditing	30	CO1	Know about basics of auditing	2	2	2		1		
			CO2	Have knowledge in accounting vouchers.	2	2	2		1		
			CO3	Acquaint with knowledge in inventory accounting.	2	2	2		1		
			CO4	Understand the fundamentals of computerized auditing	2	2	2		1		
11BC22C2	Cost Accounting – II	31	CO1	Understand the Job costing and contract costing	2	2	1				
			CO2	Understand Process costing and operating costing.	2	2	1				
			CO3	Have knowledge in standard costing and variance analysis.	2	2	1				
			CO4	Understand the marginal costing and CVP analysis	2	2	1				
11BC22C3	Banking	32	CO1	Understand the banking system and its regulations	2	2	1				
			CO2	Understand the banker and customer relationship, loans advances	2	2	1				
			CO3	Understand the negotiable instruments	2	2	1				
			CO4	Understand banking technology	2	2	1		1		
11BC22C4	Business Report writing	33	CO1	Understand the mechanism of writing				1			2
			CO2	Understand the various business letters			2				2
			CO3	Understand the preparation of short reports			1	1			2
			CO4	Understand how to gather information, study reports			2				2
11BC22C5	Human Resource Management	34	CO1	Understand the Role, Duties, and Responsibilities of Human Resource Manager		1	1		2		
			CO2	Understand the human resource planning		1	1		2		

			CO3	Understand the job analysis and job description		1	1		2		
			CO4	Understand the recruitment selection and training			2		1		2
11BC22C6	Business Research Methods	35	CO1	Understand the research, research design and problems		2	2		1		1
			CO2	Understand data collection and processing		2	2		1		1
			CO3	Understand multivariate data analysis		2	2		1		1
			CO4	Understand report writing			2		1		
11BC32C0	Management Information Systems	36	CO1	Understand MIS in business			1	2		1	1
			CO2	Understand management decision making process			1	2		1	1
			CO3	Understand different methodologies			1	2		1	1
			CO4	Understand system development and implementation			1	2		1	1
11BC32C1	Project Management	37	CO1	Understand project management and structure	2		2			1	
			CO2	Understand the project feasibility study	2		2			1	
			CO3	Understand the project evaluation and uncertainties	2		2			1	
			CO4	Understand the developing a project	2		2			1	
11BC32C2	Corporate and Allied Laws - II	38	CO1	Understand factories Act	2	2	1				
			CO2	Understand workmen’s compensation Act	2	2	1				
			CO3	Understand provident fund Act	2	2	1				
			CO4	Understand payment of gratuity Act and Bonus ACT.	2	2	1				
11BC32C3	Direct Taxes-II	39	CO1	Understand Set off and carry forward of losses and unabsorbed expenses	2		2		1		
			CO2	To know the deductions and exemptions	2		2		1		
			CO3	Understand the assessment of Individuals tax	2		2		1		
			CO4	Understand the Assessment of Partnership firm and	2		2		1		

				partners							
11BC32C4	Indirect Taxes	40	CO1	Understand the custom duty and central excise procedures	2		2		1		
			CO2	Understand the APVAT and Central sales tax	2		2		1		
			CO3	To know the various authorities under Customs and Central excise	2		2		1		
			CO4	Understand service tax proceedings.	2		2		1		
11BC32K5	Soft Skills - I	41	CO1	Understand verbal and non-verbal communications				2			1
			CO2	To know about GD, CV preparation, career objectives				2			1
			CO3	Understand the interpersonal communication skills				2			1
			CO4	Understand goal setting skills and management skills				2			1
11BC32C6	Commerce Lab I (Accounting)	42	CO1	To know the preparation of documentation, subsidiary books, day books and ledgers	1		2				
			CO2	Preparation of documents for restart partnership business	2		2				
			CO3	To know how to open the bank account and documents required	2		2				
			CO4	To know the documents preparation for negotiable instruments.	2		2				
11BC42C0	Business Strategy	43	CO1	To develop an understanding of the general and competitive business environment		1	2		2		
			CO2	to develop an understanding of strategic management concepts and techniques,	1	1	2		2		
			CO3	Understand the business polices and strategic management	1	1	2		2		
			CO4	How to formulate functional strategy	1	1	2		2		
11BC42C1	E-Commerce	44	CO1	Understand E-commerce, E-business and E-marketing	1	2	1				
			CO2	Understand the legal frame work of E-commerce	1	2	1				
			CO3	Understand the E-payments	1	2	1				

			CO4	Understand the operating system		2	1				
11BC42C2	Financial Services	45	CO1	Understand the financial system and markets	3	1					
			CO2	Understand asset financial services and merchant banking services	3	1					
			CO3	Understand financial market operations	3	1					
			CO4	Understand allied financial services.	3	1					
11BC42xx	Finance Engineering	46	CO1	Understand strategic management	3						
			CO2	Understand valuation of securities and financial restructuring	3						
			CO3	Understand the corporate restructuring	3						
			CO4	Understand the sources of finance	2						
11BC42xx	Risk Management	47	CO1	Understand the administration of risk management	2	2	2				
			CO2	Understand the risk identification and risk evaluation	2	2	2				
			CO3	Understand risk management principles	2	2	2				
			CO4	Understand risk control methods.	2	2	2				
11BC42P5	Study Project	48	CO1	To get practical exposure in accounting	2		2				
			CO2	To get practical knowledge in finance	2		2				
			CO3	To get practical knowledge in taxation	2		2				
			CO4	To get exposure in day to day transactions of a concern.	2		2				
				TOTAL	192	55	92	32	71	18	40

K L UNIVERSITY:

Vision

- To be a globally renowned university

Mission

- To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

VISION, MISSION, PEO's PO's and GA's OF DEPARTMENT:

Vision

- To be a department of International repute through continuous research, innovation and industry led curriculum.

Mission

- To Impart Quality Education with social consciousness and make them Globally Competent.
- Provide quality undergraduate and graduate education in both the theoretical and applied foundations of computer science.

- Train students to effectively apply this education to solve real-world problems
- Give students a competitive advantage in the ever-changing and challenging global work environment
- Conduct research to advance the state of the art in theoretical computer science and integrate results, innovations into other scientific disciplines

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

1. Practice engineering in a broad range of industrial, societal and real world applications.
2. Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.
3. Conduct themselves in a responsible, professional, and ethical manner.
4. Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.

PROGRAMME OUTCOMES (POs):

At the end of the B.Tech Program the student will attain the following outcomes:

1. An ability to apply knowledge of mathematics, science and engineering
2. An ability to identify, formulate, and solve engineering problems
3. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
4. An ability to design and conduct experiments, as well as to analyze and interpret data
5. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice
6. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
7. A knowledge of contemporary issues
8. An understanding of professional and ethical responsibility
9. An ability to function on multidisciplinary teams
10. An ability to communicate effectively (3g1 orally, 3g2 written)
11. A recognition of the need for, and an ability to engage in life-long learning

PROGRAMME SPECIFIC OUTCOMES (PSOs):

1. An ability to design and develop software projects as well as to analyze and test user requirements.
2. Working knowledge on emerging software tools and technologies.

			Mission Statement		
	Programme Educational Objectives	Provide quality undergraduate and graduate education in bot the theoretical and applied foundations of computer science	Train students to effectively apply this education to solve real-world problems	Give students a competitive advantage in the ever-changing and challenging global work environment	Conduct research to advance the state of the art in theoretical computer science and integrate results, innovations into other scientific disciplines
1	**Practice engineering in a broad range of industrial, societal and real world applications.**	**√**	**√**		
2	**Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.**	**√**			**√**
3	**Conduct themselves in a responsible, professional, and**		**√**	**√**	**√**

	ethical manner.				

		Programme Educational Objectives			
		Practice engineering in a broad range of industrial, societal and real world applications.	Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.	Conduct themselves in a responsible, professional, and ethical manner.	Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.
	Program Out Comes & Program Specific Outcomes				
a	Ability to apply knowledge of mathematics, science, and engineering	**√**	**√**		
b	an ability to identify, formulate, and solve engineering problems	**√**	**√**		
c	an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social,				

	political, ethical, health and safety, manufacturability, and sustainability				
d	an ability to design and conduct experiments, as well as to analyze and interpret data	**√**			
e	an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**√**			
f	the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context				
G	a knowledge of	**√**	**√**	**√**	**√**

	contemporary issues				
H	an understanding of professional and ethical responsibility			√	√
I	an ability to function on multidisciplinary teams	√		√	
J	an ability to communicate effectively (3g1 orally, 3g2 written)	√		√	√
K	a recognition of the need for, and an ability to engage in life-long learning				√
PSO1	An ability to design and develop software projects as well as to analyze and test user requirements.	√			

PSO2	Working knowledge on emerging software tools and technologies.		√		

MAPPING OF PEOs *vs.* Mission Statement (Undergraduate)

MAPPING OF Courses & Cos *vs.* PEOs (Undergraduate)

Course Code	Course Title	S NO	CO NO	Description of the Course Outcome	a	b	C	D	e	f	g	h	i	i	k	PSO 1	PSO 2
13-ES-202	Object Oriented Programming	1.	CO1	The student will be able to understand Basic Concepts of OOP, apply the concepts of classes and objects through Java Language.	**2**				**2**							3	
		2.	CO2	The student will be able to apply the concepts of constructors, Overloading, parameter passing, access control, Inheritance.	**2**				**2**							3	
		3.	CO3	The student will be able to apply Packages, Interfaces, Exception Handling.	**2**				**2**							3	
		4.	CO4	The student will be able to apply I/O Streams and understand Basic Concepts of Multi –Threading	**2**				**2**							3	
		5.	CO5	Students will be able to develop programs and projects	**2**				**2**							3	

				in java.														
13ES 204	DATA STRUCTURES	6.	CO1	apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.	**2**				**2**							3	
		7.	CO2	analyze and compare linear data structures and analyze different searching and hashing techniques.	**2**				**2**							3	
		8.	CO3	analyze and compare various non – linear data structures like Trees and Graphs.	**2**				**2**							3	
		9.	CO4	analyze and compare various sorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.	**2**				**2**							3	
		10.	CO5	understand and execute lab experiments and develop a small project along with his/her team members.	**2**			**2**	**2**							3	
13 cs 202	Human computer interaction	11.	CO1	illustrate the discussion with clients		1	1									2	
		12.	CO2	develop paradigms for interaction	1		2									2	
		13.	CO3	elucidate interface design rules			2		1							2	
		14.	CO4	evaluate the interface principles	1										2	2	
		15.	CO5	demonstrate the usage of computer softwae to generate new lauouts											2	2	

13CS 203	Operating Systems	16.	CO1	Understand the basic concepts of operating system, OS structure and process concepts.	**1**				**1**							2	
		17.	CO2	Apply the concepts Process Scheduling algorithms and Process Synchronization Problems.	**2**				**2**							2	
		18.	CO3	Solve the concept of the Deadlock, Memory Management and Virtual Memory Concepts.	**2**				**2**							2	
		19.	CO4	Demonstrate file system interface, structure, file allocation methods, free space management and threads.	**1**				**1**							2	
		20.	CO5	Create and develop a project along with his/her team members.					**3**							2	
13CS 204	Data Base Management System	21.	CO1	Explain the advantages of DBMS, its Characteristics, Concepts and ER-Model.	**1**											3	
		22.	CO2	Demonstrate Relational Database using SQL detailing the role of Relational Algebra and Relational Calculus	**2**											3	
		23.	CO3	Illustrate the normal forms of Relational DBMS detailing the process of normalization.					**2**							3	
		24.	CO4	Examine Transaction Management, Concurrency Control, File Organizations, Indexing, and Storing data.					**2**							3	
		25.	CO5	Create and Access Data Base for given Applications		**2**										3	

13 CS 205	Computer Networks	26.	CO1	Understand OSI and TCP/IP Models and basics of physical layer and their issues	**1**												2	
		27.	CO2	Demonstrate Data Link layer issues and medium access control sub layers concepts					**2**								2	
		28.	CO3	Analyze and implement the algorithms of network and transport layers and concerned services					**2**								2	
		29.	CO4	Evaluate and execute the concepts of TCP ,UDP and the application layer conceptions					**3**								2	
		30.	CO5	Demonstrate the basic concepts of protocols and their design including client/server models, connection oriented and connection-less models					**2**								2	
11-EM-301	Internet Programming	31.	CO1	Describe and Illustrate the concepts of HTML tags, and CSS through an application , DHTML, JavaScript functions	1				2								3	
		32.	CO2	Describe Java fundamentals and inheritance property and polymorphism in java	1				2								3	
		33.	CO3	Develop java programs using Encapsulation property and Exception handling	1				2								3	
		34.	CO4	Design java applications using multithreading, Applets, Design results processing application using JSP	1				2								3	
		35.	CO5	Demonstarte java programs in computer lab	1				2								3	

13 cs 301	software engineering	36.	CO1	illustrate different phases involved in the software development		**2**										3		
		37.	CO2	explain the concepts of system modeling			2									3		
		38.	CO3	design the architecure UI		2										3		
		39.	CO4	demonstrate the testing strategies	1											3		
13 cs 302	Design and Analysis of Algorithma	40.	CO1	Examine the space and time complexities of basic algorithms												2		
		41.	CO2	Demonstrate Greedy and Dynamic programming methodology for solving optimization problems		1										2		
		42.	CO3	Apply back tracking and branch and bound methodology for searching same state space trees					2							2		
		43.	CO4	identify the purpose of NP-hard, NP-complete hard graph problems and illustrate PRAM algorithms	**1**											2		
13 cs 303	Information Assurance and Security	44.	CO1	illustrate and examine conventional cryptographic procedures	1				2							2		
		45.	CO2	illustrate and examine modern cryptographic and hash algorithms		1		2								2		
		46.	CO3	demonstrate and study MAC and digital signature algorithms			1	2								2		
		47.	CO4	demonstrate and study key management distributions			1	2	2							2		

13 CS 304	Artificial Intelligence	48.	CO1	Students will able to apply PROLOG programming for the AI concepts					**2**							3	
		49.	CO2	Students will be able to relate methods for encoding Knowledge In computer systems	1											3	
		50.	CO3	Students will be able to Interpret the Problems and search related to AI	1											3	
		51.	CO4	Students will be able to infer Slot-and-filler structures and architecture of neural networks as connectionist models	**1**											3	
		52.	CO5	Demonstrate the basic concepts of artificial intelligence in the Laboratory					**2**							3	
13CS 305	Distributed Computing	53.	CO1	Distinguish centralized computing and distributed computing detailing formal model of a distributed message passing system and the complexity measures of message passing between systems presenting important abstractions for designing distributed programs	**2**				**2**							3	
		54.	CO2	Identify the leader by coordinating among processors, elaborating formal models for shared memory system and memory requirement for solving mutual exclusion problem.	**2**				**2**							3	

		55.	CO3	Utilize DSM model for inter process communication showing relationship between various types of shared objects and Identify clock synchronization problem applying tight bounds to synchronize clocks.	**2**				**2**							3	
		56.	CO4	Examine the process of realizing reliable fault tolerance in distributed systemreflecting the specific type of faulty behavior and illustrate simulation that makes Byzantine failures appear to be crash failures	**2**				**2**							3	
		57.	CO5	Experiment with laboratory programs and develop a small project along with his/her team members.	**2**				**2**							3	
13CS 306	Automata and Formal Languages	58.	CO1	The Student will be able to define & represent finite Automata and its variations & construct Finite Automata for accepting different kinds of regular languages and their inter conversions	**3**	**3**			**3**							1	
		59.	CO2	The student will be able to define regular sets, its properties and its rationale with pumping lemma of Regular Sets & Construct Finite Automata from regular languages and vice-versa	**3**	**3**			**3**							1	
		60.	CO3	The Student will be able to describe grammars, its representation and the foundation for parsing mechanism of language semantics and constructing context free grammars for different languages			**3**									1	

		61.	CO4	The Student will be able to define & represent Push down Automata and its variations and Construct a PDA for real world problems and its justification with Grammars				**3**	**3**							1	
		62.	CO5	The Student will be able to define Turing Machine and its variations & construct Turing Machine for unrestricted languages				**3**	**3**							1	
13-CS401	Compiler Design	63.	CO1	Understand the overall compiler architecture and design of Lexical Analyzer	**2**											2	
		64.	CO2	Construct the parser using the Yacc tool	**3**			**3**								2	
		65.	CO3	Analyze Syntax directed definition and its translations schemes, intermediate code	**2**				**2**							2	
		66.	CO4	Apply the code optimization and generation techniques in the development of a compiler.	**2**				**2**							2	
		67.	CO5	Design of simple compiler using LEX and YACC tools											3	2	
13-CS402	simulation and modelling	68.	CO1	Understand the History and need of Simulation and Modeling with Examples.	**1**				**1**							2	
		69.	CO2	Analyze Various general principles, Statistical and Queueing Models.	**2**				**2**							2	
		70.	CO3	Analyze Simulation of Input Modeling and Verification and Validation of the Models	**2**				**2**							2	

		71.	CO4	Apply the Simulation on Manufacturing and Material Handling Systems, Computer System and Computer Networks.	**2**				**2**							2	
		72.	CO5	Develop the basic concepts of Simulation and Modeling	**2**				**2**						3	2	
13CS 331	Data Warehousing and Mining	73.	CO1	Student should be able to Understand the necessity of data preprocessing in construction of data warehouse.	1												3
		74.	CO2	Student should be able to Analyze multidimensional data using OLAP tools to facilitate effective data mining.	2	2			**s**								3
		75.	CO3	Student should be able to Apply the concepts of data analysis and clustering to postulate accurate classification model for a given problem.		2	2										3
		76.	CO4	Student should be able to Recommend a methodology formining complex data types and detection of anomaly for the given Application.	3		3										3
13CS 332	Advanced Database Management Systems	77.	CO1	Understand the fundamentals of query optimization and database recovery protocols.	**1**												3
		78.	CO2	Analyze emerging database technologies and distributed databases.			**2**										3
		79.	CO3	Discriminate object oriented and relational database systems.	**2**												3
		80.	CO4	Analyze multimedia databases.			**2**										3

11-CS-432	Big Data Analytics	81.	CO1	Explain the big data that is emerging from multiple big data sources in terms of velocity, variety and veracity	**1**												3
		82.	CO2	Illustrate the technologies, processes and methods for analyzing big data					**2**						2		3
		83.	CO3	Demonstrate the key principles of data analysis using the R tool					**2**								3
		84.	CO4	Examine advanced Graphs, Regression, Forecasting and Time Series models using R analytical platform.											3		3
13-CS-333	Database Security	85.	CO1	Understand the fundamentals of database security and security risks related to user administration	**1**				**1**								2
		86.	CO2	Apply password policies and security models					**2**								2
		87.	CO3	Analyze virtual private database using views in SQL Server 2000 and Oracle 10g and understand database auditing, auditing models	**2**										2		2
		88.	CO4	Apply auditing techniques on the real world problems using Oracle 10g and SQL server 2000	**2**										2		2
13-CS-431	Distributed Databases	89.	CO1	Summarize distributed databases		**1**											3
		90.	CO2	Analyze parallel database for searching, sorting, join and group by join.		**2**			**2**								3
		91.	CO3	Apply parallel database for indexing, collection of join query, scheduling, optimizing, transactions in Distributed, Grid Databases and Grid Concurrency Control.		**2**			**2**								3
		92.	CO4	Illustrate grid transaction atomicity, durability, replica		**2**			**2**								3

				management and data intensive applications.														
13CS 334	TCP/IP Protocol suite	93.	CO1	Understand the basic components of TCP Protocol suite.	**1**													3
		94.	CO2	Understand the concepts of IP protocol ,mobile IP,P Addressing mechanisms & attacks on IP	1													3
		95.	CO3	Apply socket API to write programs related to client server communication					**1**						2			3
		96.	CO4	Analyze Various Networking Applications & Network management techniques via a case study/ NS2 simulator tool.					**1**						2			3
13-CS335	NETWORK PROGRAMMING	97.	CO1	Student will be able to Understand the key components of Network Programming	1				1									3
		98.	CO2	Student will be able to Apply socket API for TCP and UDP to write programs related to Client/Server communication	1				1						2			3
		99.	CO3	Student will be able to Analyze various Advanced Sockets & Networking Applications through Unix domain protocols and Routing Sockets	1				1						2			3
		100.	CO4	Student will be able to construct multiple threads that communicate with each other using Sun RPC	1				1						2			3
13-	Routing	101.	CO1	Understand the need of Routing Algorithms, framework	**1**													3

CS-336	Algorithms			and principles of Network Flow Modelling														
		102.	CO2	Analyze the routing algorithms with its working and comparison					**2**									3
		103.	CO3	Understand the routing achitectures and quality of service in routing	**1**													3
		104.	CO4	Analyze the working structure of VOIP Routing					**2**									3
13-CS-433	High speed Optical Communication Networks	105.	CO1	Understand the basics of light signals and different types of optical communication link methodologies					**1**									2
		106.	CO2	Understand the concepts of transmission characteristics of optical fibers and dispersion					**1**									2
		107.	CO3	Analyze the concepts of optical transmission and detectors, electro optic modulation and optical amplifier					**2**									2
		108.	CO4	Analyze the concept of basic networks					**2**									2
13-CS-434	Wireless Communications and Networking	109.	CO1	The course will provide knowledge of information security technology and methods for communication systems that provide services for mobile users by wireless access networks.	**2**													2
		110.	CO2	Knowledge and understanding of security mechanisms and protocols in wireless communication systems, such as the topical technologies of WLAN IEEE 802.11, WAN					**2**									2

				802.16, GSM/UMTS/LTE, Ad-hoc and sensor networks.														
		111.	CO3	Knowledge about some of the models, design principles, mechanisms and solutions used in wireless network security to obtain authentication and key transport protocols.					**2**									2
		112.	CO4	Students will gain an understanding of wireless networking, protocols, and standards and security issues											2			2
13CS 337	Object Oriented Analysis and Design	113.	CO1	Understanding the concepts of UML (Unified Modeling Language)and UP(Unified Processing)		**1**									1			3
		114.	CO2	Analyze the requirements using UML		**2**									2			3
		115.	CO3	Create class and objects using UML.		**3**									3			3
		116.	CO4	Design and implement the software using UML.		**3**									3			3
13 CS 338	Requirement Engineering	117.	CO1	Students will able to Identify stakeholders and their influence on the system requirements.					**2**									2
		118.	CO2	Students will be able to Identify and classify non-functional requirements, influences and constraints.	1													2
		119.	CO3	Students will be able to Validate requirements and Document and trace requirements using computer-based tools.	1													2

		120.	CO4	Students will be able to infer Practice the different roles in the requirement engineering process, by working in groups analysis	**1**												2
13 CS 435	Software Reliability	121.	CO1	Explain software Reliability measures viz., mean time to failure, Failure Rate Function, Reliability Function for Common Distributions, Maintainability and Availability;	**1**												2
		122.	CO2	Illustrate software verification, validation and their relation to software reliability		**1**											2
		123.	CO3	Demonstrate estimation of reliability using failure data of a software product and software cost model based on software reliability		**1**											2
		124.	CO4	Examine a suitable reliability model for the product											2		2
13-CS-339	Software Testing & Quality Assurance	125.		Ability to define software systems by using various testing principles followed by test processes by inferring test generation methods and FSM models.	**1**						1						2
		126.		Make test adequacy assessment with the help of various source tools and application of those techniques in commercial environment.	**2**				**2**								2
		127.		Analyze and prepare quality management by considering governmental standards, pareto principles and up-front quality technique.	**2**												2
		128.		Relate the concepts of software safety and its relation	**3**						3						2

				to software quality assurance for the development of small projects.														
13-CS-436	Software Project Management	129.		Ability of the students to Develop project plans for different types projects	**1**													2
		130.		Ability to estimate time, cost, effort, resource requirements and the quality												2		2
		131.		Ability to undertake risk management for a given project												2		2
		132.		Ability to handle different tools using which project management is undertaken												2		2
13-CS-340	SECURE PROGRAMMING	133.	CO1	Students will be able to Define the concept of Secure Systems Design, Security Goals , Secure Design Principles.	**1**													2
		134.	CO2	Students will be able to show the Client-State Manipulation with SQL Injection for Password Security and Cross-Domain Security in Web Applications	**1**													2
		135.	CO3	Students will be able to Find Static Analysis as Part of the Code Review Process and procedure for Handling Input Buffer Overflow	**1**													2
		136.	CO4	Students will be able to List the process of Errors and Exceptions in Web Applications, XML and Web Services with the help of Privacy And Secrets Privileged Programs	**1**													2

13CS 341	CRYPTANALYSIS	137.	CO1	Understand the classic ciphers and world war II ciphers	**1**													3
		138.	CO2	Understand the Stream Ciphers and Block Ciphers			**2**											3
		139.	CO3	Illustrate and Examine Hash Functions	**1**													3
		140.	CO4	Describe the Public Key System and analyze the Attacks on Public Key System			**2**											3
13-CS-342	Elliptic curve Cryptography	141.	CO1	Understand the Equations, Laws and Proofs for Elliptic Curve	1				**1**									2
		142.	CO2	Understand the Torsion Points, Elliptic Curve Over Finite Fields		**1**		**1**										2
		143.	CO3	Understand the Discrete Logarithm Problem, Elliptic Curve Cryptography			**1**	**1**										2
		144.	CO4	Understand the Applications, Divisiors, Hyper Elliptic Curves.			**1**	**1**										2
13-CS-437	Cyber Security	145.	CO1	Illustrate Web Application (In) security, Core Defense Mechanisms, Web Application Technologies, Mapping the Application, Bypassing Client-Side Controls.	2													2
		146.	CO2	Analyze Attacking Authentication, Attacking Session Management, Attacking Access Controls, Attacking Data Stores, Attacking Back-End Components.		**2**												2
		147.	CO3	Categorize Attacking Application Logic, Attacking Users: Cross-Site Scripting, Attacking Users: Other Techniques, Automating Customized Attacks, Exploiting Information		**2**												2

				Disclosure.														
		148.	CO4	Inspect Attacking Native Compiled Applications, Attacking Application Architecture, Attacking the Application Server, Finding Vulnerabilities in Source Code.		**2**												2
13-CS-438	Trust Worthy Computing	149.		Students are able to understandimportance of system reliability using common statistical distributions and the importance of reliability models.	1	**1**												2
		150.		Students are able to analyzesecurity risk by using quantitative models and stopping rules in software testing.	2											2		2
		151.		Students are able to analyze availability modeling and investigate the reliability in simple and complex embedded systems, Introduction to Microsoft TWC.	2	**2**												2
		152.		Students are able to understand applications of aspect-oriented programming in trustworthy computing.	2				**2**									2
13CS 343	Advanced Computer Architecture	153.	CO1	Student will be able to Understand the Overview of von Neumann architecture and Pipelining	1													2
		154.	CO2	Student will be able to Demonstrate Hierarchical Memory Technology	1													2
		155.	CO3	Student will be able to Explain the Instruction level parallelism	1													2

		156.	CO4	Student will be able to Analyze the Multiprocessor Architecture	2								2				2
13-CS-344	Parallel Computing	157.	CO1	Understand the performance improvements of uni-processor systems through pipelining, classify different parallel processing systems.	**1**												2
		158.	CO2	Differentiate shared memory and distributed memory systems, design parallel programs through shared memory programming API 's	**2**												2
		159.	CO3	Apply the MPI features to solve the Distributed memory programming problems					**2**								2
		160.	CO4	Analyze the parallel programming concepts on PRAM computing model.					**2**								2
11CS 439	Cloud Computing	161.	CO1	Understand Enterprise cloud computing paradigm.	**1**												2
		162.	CO2	Understand PaaS cloud Computing Envinorments.								1					2
		163.	CO3	Analyze the performance of High performance computer on clouds.						2							2
		164.	CO4	Evaluate the data security issues in clouds.											3		2
13-CS-345	Grid Computing	165.	CO1	Understand and analyze the parallel programming concepts complex systems	**2**												2
		166.	CO2	Apply the concepts of parallel programming using											2		2

				CORBA														
		167.	CO3	Understand and analyze the concepts of cluster computing and its deployment	**2**				**2**									2
		168.	CO4	Understand and integrate the resources and services in Metacomputing					**2**									2
13-CS-440	High Performance Computing	169.	CO1	Apply parallel programming algorithms														3
		170.	CO2	Understand and apply the analytical modelling of parallel programs														3
		171.	CO3	Apply and analyze the GPU programming														3
		172.	CO4	Apply parallel programming to heterogeneous computing														3
13CS 346	2D/3D Graphics	173.	CO1	Students are able to understand two-dimensional Computer Graphics	**1**													3
		174.	CO2	Students are able to solve mathematical methods for three dimensional computer graphics	2				**2**									3
		175.	CO3	Students are able to compare and contrastrealistic rendering	2											2		3
		176.	CO4	Students are able to explain geometric modeling	1													3
13CS	Digital Image	177.	CO1	Describe the uses of Digital Image Processing and its Applications, Image Acquisition and Image	**1**				**1**									3

347	Processing			Enhancement														
		178.	CO2	Analyze image enhancement algorithms such as histogram modification, contrast manipulation, edge detection and restoration		**1**		**1**										3
		179.	CO3	Inspect how Wavelet, Multi-resolution, Compression and Morphological Image Processing are realized			**1**	**1**										3
		180.	CO4	Illustrate Image Segmentation, Representation and Description and Object Recognition process			**2**	**2**										3
13-CS-348	Animation	181.	CO1	Understand the basics and technical background of animation.	**1**													3
		182.	CO2	Analyze the techniques used for Motion capturing and types of Animations					**2**						2			3
		183.	CO3	Understand the concepts of fluids and image modeling					**1**									2
		184.	CO4	Understand the various types of animation.					**1**									1
13-CS-441	Video and Audio Streaming	185.	CO1	Understand the video formats and usage of video compression techniques.	**2**													3
		186.	CO2	Analyze the audio compression techniques and introduction to streaming media											2			2
		187.	CO3	Understand and Analyze the concepts of audio and video encoding and preprocessing					**1**									2

		188.	CO4	Apply stream serving and live web casting techniques for various files	**2**													2
13-CS-442	Multimedia Technologies	189.	CO1	Understand the framework and standards for multimedia communication	**1**													2
		190.	CO2	Analyze the application layer services for multimedia technologies					**2**									2
		191.	CO3	Understand the middleware layer streaming for media coding												1		2
		192.	CO4	Apply and analyze the Network layer functionalities for multimedia technology	**2**				**2**									2
13CS 349	Soft Computing	193.	CO1	Explain soft computing differentiating hard and soft computing and enumerate briefly overview of fuzzy systems , neural networks and genetic algorithms	**1**													2
		194.	CO2	Demonstrate a fuzzy controller using fuzzy logic systems		**2**		**2**										2
		195.	CO3	Interpret pattern recognition using artificial neural network		**2**		**2**										2
		196.	CO4	Interpret Genetic algorithms and operations,.		**2**		**2**										2
13CS 350	Machine Learning	197.	CO1	Understand and apply the differences among the styles of learning: supervised, reinforcement, unsupervised and parametric methods	**1**													2

		198.	CO2	Comprehend probabilistic methods for learning and for classification					**2**									2
		199.	CO3	Analyze the non parametric methods and decision trees to take the proper decision making.	**2**													2
		200.	CO4	Understand rule based knowledge and Kernel machines to reduce the cost of various statistical methods , Bayesian Estimation, HMM models	**2**													2
13-CS-351	Natural Language Processing	201.	CO1	Understand the concept of Essential Information Theory , Linguistic Essentials and Statistical Inference n-gram models	**2**													3
		202.	CO2	Analyze Word Sense Disambiguation ,HMM and CFG	2								2					3
		203.	CO3	Illustrate Text and Sentence Alignment, Clustering in detail.	2								2					3
		204.	CO4	Explain Information Retrieval and Text Categorization , Perceptron in detail.	**2**								2		2			3
13-CS-443	Multi Agent Systems	205.	CO1	Students will be able to compare and contrast different types of Agents	**2**				**2**									2
		206.	CO2	Students will be able to illustrate how agents interact with each other to perform tasks delegated to them	**2**				**2**									2
		207.	CO3	Students will be able to choose different methodologies for designing and developing an Agent	**3**				**3**									2

		208.	CO4	Students will be able to explain the various applications of Agents	**2**				**2**									2
13-CS-444	Computer Vision	209.	CO1	Understand Image representation and modeling	**1**													2
		210.	CO2	Apply Image transformation methods					**2**									2
		211.	CO3	Interpret image processing algorithms	**1**													2
		212.	CO4	Understand face detection and recognition algorithms					**1**									2

K L UNIVERSITY

Vision and Mission Statement

2013

Vision

To be globally renowned university

Mission

To impart quality in higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging social needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values

K L UNIVERSITY

SCHOOL OF BIOSCIENCES AND BIOENGINEERING

DEPARTMENT OF BIOTECHNOLOGY

2013

VISION, MISSION, LONG TERM GOALS, SHORT TERM GOALS, PEO'S AND PO'S

VISION:

Attaining new heights in academic and research with global perspective for creation of health, wealth and welfare by applying engineering knowledge, creativity and technologies that will provide solutions to environmental, industrial, agricultural and health based problems.

MISSION:

- Impart scientific knowledge, strengthen R&D and educate the student to cater the global requirements in bioengineering technologies leading to an all-round professional and societal development by the student to empower India's incomparable human resource.

LONG TERM GOALS:

- To develop center for excellence.
- To achieve International projects and Patents.
- To develop incubation center for global needs.
- To attain DST-FIST level II.

SHORT TERM GOALS:

- To conduct International Conferences.
- To uplift all the laboratories so as to promote research and consultancy.
- To provide an excellent infrastructure facility to publish high indexed journals.
- To encourage teaching assistantship for the development of human values.
- To attract international students in UG, PG and PhD courses.
- To place students in core companies.

PROGRAM EDUCATIONAL OBJECTIVES

The Program Educational Objectives (PEOs) of a program that describes the expected achievements of graduates while completion of their graduation. Long term vision of the program outcome is to guide the students at National & International standards of the institutes. The below chosen PEO's lead to the selection of courses under different categories in B.Tech Biotechnology are as follows:

1. Practice engineering in a broad range of industrial, societal and real world applications.
2. Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.
3. Conduct themselves in a responsible, professional, and ethical manner.
4. Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.

STUDENT OUTCOMES:

Student outcomes are the skills and knowledge which the students have at the time of graduation. These Outcomes are generic and are common to all engineering programs. The BTech programs at KL University are designed to meet the **Student Outcomes** as identified by Washington Accord. These constitute a superset of program outcomes identified by National Board of Accreditation.

a. An ability to apply knowledge of mathematics, science, and engineering

b. An ability to design and conduct experiments, as well as to analyze and interpret data

c. An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

d. An ability to function on multidisciplinary teams

e. An ability to identify, formulate, and solve engineering problems

f. An understanding of professional and ethical responsibility

g. An ability to communicate effectively

h. The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.

i. A recognition of the need for, and an ability to engage in life-long learning

j. A knowledge of contemporary issues

k. An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

MAPPING OF PEOs WITH THE MISSION OF THE DEPARTMENT

DEPARTMENT OF BIOTECHNOLOGY 2013

Key components From Department Mission		Mission 1	Mission 2
		Strengthen R&D and impart scientific to the student to cater the global requirements in bioengineering technologies.	Implement the scientific knowledge and understanding towards the all-round professional and societal development by the student.
PEO1	Practice engineering in a broad range of industrial, societal and real world applications.	✓	✓
PEO2	Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.	✓	
PEO3	Conduct themselves in a responsible, professional, and ethical manner.		✓
PEO4	Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.	✓	✓

MAPPING OF PEOs WITH THE POs OF THE DEPARTMENT

DEPARTMENT OF BIOTECHNOLOGY 2013-14

SOs		PEO 1	PEO 2	PEO 3	PEO 4
a	An ability to apply knowledge of mathematics, science, and engineering	✓	✓	✓	✓
b	An ability to design and conduct experiments, as well as to analyze and interpret data	✓	✓		✓
c	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability		✓		✓
d	An ability to function on multidisciplinary teams	✓	✓		✓
e	An ability to identify, formulate, and solve engineering problems	✓	✓		✓
f	An understanding of professional and ethical responsibility			✓	
g	An ability to communicate effectively	✓	✓	✓	
h	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context		✓		
i	A recognition of the need for, and an ability to engage in life-long learning				✓

j	A knowledge of contemporary issues		✓		✓
k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice	✓	✓		✓

DEPARTMENT OF BIOTECHNOLOGY
K L UNIVERSITY
Green fields, Vaddeswaram, Guntur

MAPPING OF COURSES WITH STUDENT OUTCOMES (2013 Regulations)

S No	Course Code	Course Title	Catgory	L-T-P	Credits	Pre-Requisite	Student Outcome									
							a	b	c	d	e	f	g	h	i	j	k
1	13HS101	English	Humanities & Social Sciences	2-0-2	3	Nil*							2		1		
2	13BS102	Differential Equations	Basic Sciences	3-1-0	4	Nil	2	2									
3	13HS102	Language and Reasoning Skills	Humanities & Social Sciences	2-0-2	3	Nil*							2		1		
4	11BS105	Ecology & Environment	Humanities & Social Sciences	2-0-0	2	Nil*						1				1	
5	13HS104	Human Values	Humanities & Social Sciences	2-0-0	2	Nil*								1		1	

6	13BS103	Engineering Physics	Basic Sciences	3-0-2	4	Nil*	2	1									
7	11BS104	Engineering Chemistry	Basic Sciences	3-0-2	4	Nil*	2	1									
8	13ES106	Engineering Mechanics	Engineering Sciences	3-0-2	4	Nil	2				2						
9	13ES105	Workshop Practice	Engineering Sciences	0-0-4	2	Nil											2
10	13ES103	Engineering Materials	Engineering Sciences	3-0-0	3	Nil*	1									1	
11	13ES101	Problem Solving Through C	Engineering Sciences	3-0-2	4	Nil	2				2						
12	13BS101	Linear Algebra and Multivariable Calculus	Basic Sciences	3-0-2	4	Nil	2	2			2						
13	13ES102	Measurements	Engineering Sciences	3-0-2	4	Nil*		2			1						
14	11ES104	Engineering Graphics with CAD	Engineering Sciences	0-0-4	2	Nil*		2									1
15	13BS201	Mathematical Methods	Basic Sciences	3-0-0	3	13BS101	2										

16	13ES201	Thermodynamics	Engineering Sciences	3-0-0	3	13BS103	2				1						
17	13EE201	DC Machines and Transformers	Professional Core	3-0-2	4	13EE201		2			2						2
18	13ES202	Object Oriented Programming	Engineering Sciences	3-0-2	4	13ES101	2										1
19	13ES204	Data Structures	Engineering Sciences	3-0-2	4	13ES101	2				2						
20	13ES203	Network Theory	Engineering Sciences	3-0-2	4	13BS101	2										1
21	13ES106	Engineering Mechanics	Engineering Sciences	3-0-2	4	NIL											
22	13ES204	Data Structures	Engineering Sciences	3-0-2	4	13ES101		2			2						
23	13BT202	Microbiology	Professional Core	3-0-2	4	NIL	1				2						3
24	13BT201	Biochemistry	Professional Core	3-0-2	4	NIL	2	3			3						
25	13BT204	Bioanalytical techniques	Professional Core	3-0-2	4	NIL	2	3	3		2						
26	13BT305	Biochemical reaction engineering	Professional Core	3-0--2	4	NIL	1	3	3		2					2	3
27	13BT306	Immunology	Professional Core	3-0--2	4	NIL	2	2									2

28	13BT302	Genetic Engineering	Professional Core	3-0--2	4	NIL		3			3						
29	13BT303	Bioinformatics	Professional Core	3-0--2	4	NIL		2									3
30	13BT304	Fermentation Technology	Professional Core	3-0--2	4	NIL					3						2
31	13BT401	Mass Tranfer Operations	Professional Core	3-0--2	4	NIL		2									3
32	13BT308	Plant and Animal Biotechnology	Professional Core	3-0--2	4	NIL						2		3			
33	13BT301	Fluid Mechanics and Heat Transfer	Professional Core	3-0--2	4	NIL						2		3			
34	13BT307	Food Technology		3-0-2	4	NIL					3						2
35	13BT402	Down Stream Processing	Professional Core	3-0--2	4	NIL		3			2						2
36	15IE3250	Term Paper	Professional Core	3-0--2	2	NIL		2		3	3		3		2		
37	15 IE 4049	Minor Project	Professional Core	0-0-4	2	NIL	3						3				
38	15 IE 4048	Practice School	Professional Core	0-0-16	8	NIL											
39	15 IE 4050	Major Project	Professional Core	0-0-16		NIL	3		3				3	3	3	3	

40	13BT331	Molecular Genetics & DNA forensics	Professional Elective(Genetic Engineering)	3-0-0	15	NIL	2						1						
41	13BT332	Transgenic Technology		3-0-0		NIL	2				2								
42	13BT431	Genomics & Proteomics		3-0-0		NIL	2				2								
43	13BT432	Molecular Expression Technology		3-0-0		NIL	2					2		1					
44	13BT433	Molecular Markers and Diagnostics		3-0-0		Nil						1			1				
45	13BT337	Microbial technology	Professional Elective (Industrial Biotechnology)	3-0-0		Nil	2						1						
46	13BT442	Metabolic Engineering		3-0-0		Nil	1												2
47	13BT440	Bioprocess Plant Design and Economics		3-0-0		Nil		1											2
48	13BT441	Algal Biotechnology																	
49	13BT338	Pharmaceutical Biotechnology		3-0-0		Nil	1					1							

50	13BT333	Molecular Modelling and Drug Design	Professional Elective (Bioinformatics)	3-0-0		Nil	2	2											
51	13BT334	Bioperl& Perl Programming		3-0-0		Nil	2						1						
52	13BT434	Biomedical Informatics		3-0-0		Nil	1	1											
53	13BT436	Darabase Management Systems		3-0-0		Nil	1					1							
54	13BT435	Systems Biology		3-0-0		Nil	2						1						
55	13BT438	Cancer Biology	Professional Elective (Immunology)	3-0-0		Nil	1							1					
56	13BT336	Stem Cell Technology		3-0-0		Nil	2					1							
57	13BT335	Immunotechnology		3-0-0		Nil	1												2
58	13BT437	Medical Biotechnology		3-0-0		Nil	1												2
59	13BT439	Neuro Biology		3-0-0		Nil	1												2
63		Paradigms in Management Thought	Management Elective	3-0-0	3	NIL									1	1			

64	11HS203	Indian Economy		3-0-0	3	NIL	1	1										
65	11HS208	Managing Personal Finance		3-0-0	3	NIL	1	2	3									
66	11HS209	Basics of Marketing for Engineers		3-0-0	3	NIL		3										
67	11HS211	Organization Management		3-0-0	3	NIL	1		1									
68	11 OE414	Disaster Management	Open Elective	3-0-0	3	NIL	1		2									
69	11OE309	Remote Sensing and GIS		3-0-0	3	NIL	2											
70	11OE408	IPR & Patent Laws		3-0-0	3	NIL	2											
71	11OE426	Renewable Energy Resources		3-0-0	3	NIL	2								2			
72	11OE433	E-Commerce		3-0-0	3	NIL										2	2	
73	13OE429	Fundamentals of Information Technology		3-0-0	3	NIL	2				2							

74	13OE421	Linux Programming		3-0-0	3	NIL					2							2
75	11 OE 431	Radar Systems		3-0-0	3	NIL					2							
76	11-OE-422	Optical Engineering		3-0-0	3	NIL	1				2							
77	11-OE-424	Mobile Communications		3-0-0	3	NIL	2				2							
78	11OE432	Data Warehousing And Mining		3-0-0	3	NIL										2	2
79	12OE445	Fundamentals of Database Management Systems		3-0-0	3	NIL	1	2									
80	13-OE475	Measurements AndInstrumentation		3-0-0	3	NIL					1						
81	13 OE 432	Animation for Engineers		3-0-0	3	NIL	1								2		
82	13OE433	Photography		3-0-0	3	NIL					2						
83	12OE442	Mechatronics		3-0-0	3	NIL			2		2						
84	12OE443	Robotics		3-0-0	3	NIL	3		2								
85	13TP401	Term Paper		0-0-4	2					2					2		

87	13PW401	Major Project		0-0-24	12					2				2			
Totals							49	24	8	3	27	8	9	6	10	8	21

DEPARTMENT OF BIOTECHNOLOGY
K L UNIVERSITY
Green fields, Vaddeswaram, Guntur

COURSE ARTICULATION MATRIX (2013 Regulations)

Course Code	Course Title	S No	CO NO	Description of the Course Outcome	a	b	c	d	e	f	g	h	i	j	k
11BT402	Down Stream Processing (DSP)	1	CO1	Acquire the knowledge of rheological properties of fermentation broth, principle behind the unit operations for Recovery of intracellular products and removal of suspended solids.	1										
		2	CO2	Acquire the knowledge ofProduct Enrichment Operations, principle behind the unit operations for membrane separations and Design Combinations of Unit operation for process development.	1										
		3	CO3	Acquire the knowledge ofchromatography;Understand the principle behind the Alternative Separation Methods and unit operations for polishing and formations.	1										

		4	CO4	Design new processes for purification of products, application of appropriate technique/unit operation for the process and evaluate the financial feasibilities of the newly designed process.	2										
11BT401	Bioprocess Dynamics and Control	5	CO1	Acquire the knowledge of bioprocess Dynamics and Control basics.	1										
		6	CO2	Use various control strategies to monitor and control bio process variables for better yield of biomass and product formation.		2									
		7	CO3	Design and construct advanced control systems to regulate the progress of biological system.											3
		8	CO4	Develop various strategies for steam jacketed cattle and microprocessor based control systems.											3
11BTE34	MOLECULAR MODELING AND DRUG DESIGN	9	CO1	Understand basic concepts in generation of reliable model molecules and various strategies of molecular modeling	1										
		10	CO2	Understand various methods for predicting protein structure.	1										
		11	CO3	Understand methods of exploring dynamics of proteins, identification of putative drug targets and potential drug lead molecules.		2									
11BTE45	ALAL BIOTECHNOLOGY	12	CO1	Understand basic cocepts of algal biology and its cultivation techniques	1										
		13	CO2	Biotechnological properties of cyanobacteria and its applications in field of industrial biotechnology						1					
		14	CO3	Role of biofertilizers and biopesticides in agriculture and industry											1
		15													

11BTE41	Cancer Biology	16	CO1	Describe the basic concepts of cancer and carcinogenesis	1									1	
		17	CO2	Understand Molecular Biology of cancer and cancer metastasis	1									1	
		18	CO3	Understand immunological response against cancer	1									1	
12BT301	Plant and Animal Biotechnology	19	CO1	Understand the basics of Plant Tissue Culture	1							1			
		20	CO2	Apply the Plant Tissue culture to Genetic engineering	2					2					
		21	CO3	Understand the importance of Animal Tissue culture	1										
		22	CO4	Apply the Transgenic technology to Animals	2					2					
		23	CO5	Produce *In vitro* culture plants and cells		3						1			
11BT302	GENETIC ENGINEERING	24	CO1	Understand the methods of recombinant DNA technology	1										
		25	CO2	Compare different vectors and assess recombinant DNA molecules	1										
		26	CO3	Distinguish types of PCR, gene transfer methods					2						
		27	CO4	Compile gene technology methods					3						
		28	CO5	Design and construct recombinant DNA molecule		3	3								
11BT303	Biomedical Sciences	29	CO1	Understand and apply the various biomedical signals on human body with reference to rehabilitation engineering and neuroengineering	2	2		2	2		2				2
		30	CO2	Apply the fundamental principles various biomedical systems on solving problems in the areas of human anatomy signals(calculation of an ECG spectrum using Fourier Series and calculation of Heart Rate Variability using Fourier Transforms)	2	2		2	2		2				2
		31	CO3	Apply theNoise and Feed Back System on cardiovascular processes with reference tobiomedical engineering and signal imaging processes.	2	2		2	2		2				2

		32	CO4	Analyze the biomedical signals and systems on various physiological system with reference to biomedical electronics, medical instrumentation, medical imaging, biomedical signal processing, rehabilitation engineering, and neuroengineering	2	2		2	2		2				2
11BT304	FERMENTATION TECHNOLOGY	33	CO1	Demonstrate the basic knowledge of fermentation process	1										
		34	CO2	Use principles of optimization techniques and interpret mass balance equation of biological system to assess the microbial kinetics.					2						
		35	CO3	Use various principles of bio catalytic processes to asses the sterilization efficiency, produce value added products and asses mass transfer effects on the growth of bacteria, yeast and other microorganisms .					2						2
		36	CO4	Design and construct bioreactor systems to scale up and scale down fermentation process for better yield of biomass and product formation											3
11BTE30	Molecular Genetics and DNA Forensics	37	CO1	Understand the organization and functions of chromosomes; types of sequences.	1						1				
		38	CO2	Understand the importance of genetic recombination and regulation of gene expression.	1						1				
		39	CO3	Apply the knowledge of DNA forensics to crime scenario and the importance of molecular techniques in DNA forensics.	2										
		40	CO4	Analyze the role and importance of X, Y chromosome and mtDNA in DNA forensics and Case studies involving various techniques in forensic investigations	2										

11BTE46	Pharmaceutical Biotechnology	41	CO1	Understand the importance of pharmaceutical products in biology	1										
		42	CO2	Understand drug metabolism and pharmacokinetics						1					
		43	CO3	Applications of parmaceutical products in medicine and industry										1	1
13BT201	BIOCHEMISTRY	44	CO1	Define, describe and discuss the functions and properties of biomolecules (carbohydrates, nucleic acids, proteins, lipids) in biological systems	1										
		45	CO2	Outline, classify and compare the organization and biochemical properties of biomolecules	1										
		46	CO3	Distinguish metabolism and metabolic pathways of biomolecules in biological systems	2										
		47	CO4	Interpret and appraise the role metabolism and functions of biosignaling in biological systems	2										
		48	CO5	Evaluate and test the presence of macromolecules in biological compounds		3			3						
13BT202	MICROBIOLOGY	49	CO1	Acquire the knowledge about history and classification of microorganisms	1										
		50	CO2	identify morphology and cell strucutre of microorganisms					2						
		51	CO3	categorize growth phases and factors affecting growth					2						2
		52	CO4	examine types of media sterilization and carious diseases											3
		53	CO5	formulate various sterilization, isolation , culturing techniques for microbes											3
13BT203	PROCESS ENGINEERING	54	CO-1	describe the engineering calculations in Bioprocess Technology principles.	1										2

	PRINCIPLES	55	CO-2	analyze various microbial parameters using stoichiometry calculations	1										2
		56	CO-3	Employ the basic principles of material balance of a various reaction systems and Estimate the chemical and microbial kinetic parameters for better biomass and product formation	1										2
		57	CO-4	Employ the basic principles of Energy balance of a various reaction systems and Estimate the chemical and microbial kinetic parameters for better biomass and product formation.	1										2
13ES204	DATA STRUCTURES	58	CO1	Student will be able to apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.	2			2							
		59	CO2	Student will be able to analyze and compare linear data structures and analyze different searching and hashing techniques.	2			2							
		60	CO3	Student will be able toanalyze and compare various non – linear data structures like Trees and Graphs.	2			2							
		61	CO4	Student will be able to analyze and compare varioussorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.	2			2							
		62	CO5	Studentwill be able to understand and execute lab experiments and develop a project along with his/her team members.		2									
13AC201	Energy and Society	63	CO1	Understand the various forms of available energy and energy related aspects.								1		1	

		64	CO2	Apply energy auditing methodology to estimate energy conservation of different case studies.								2		2	
		65	CO3	Understand the environmental and geological impacts on the energy vice versa.								1		1	
		66	CO4	Apply the planning and controlling aspects for economical energy usage.								2		2	
11OE408	IPR AND PATENT LAWS	1	CO1	Recognise the importance of Intellectual property rights	1										
		2	CO2	Discuss and describe principles, scope and functions of GATT & WTO	1										
		3	CO3	Understand and summarise regulatory affairs	1										
		4	CO4	Prepare Documentation and protocols; case studies on patents	2									2	
13ES 202	Object Oriented Programming (through Java)	25	CO1	The student will be able to understand Basic Concepts of OOP, apply the concepts of classes and objects through Java Language.	2				2						
		26	CO2	The student will be able to apply the concepts of constructors, Overloading, parameter passing, access control, Inheritance.	2				2						
		27	CO3	The student will be able to apply Packages, Interfaces, Exception Handling.	2				2						
		28	CO4	The student will be able to apply I/O Streams and understand Basic Concepts of Multi –Threading	2				2						
		29	CO5	Students will be able to develop programs and projects in java.	2				2						

13BS204	Probability and Statistics		CO1	Interpret numerical data through various graphs and determination of various constants of the data	2										2
			CO2	Measure and estimate the degree of linear relationship between two variables	2										2
			CO3	Identify the suitable probability distribution to the given experimental data and calculation of various characteristics of the respective probability distributions	2										2
			CO4	Draw the statistical inference of the given data through various tests of statistical hypothesis, viz., tests for means (single and two), analysis of variance	2										2
13ES201	THERMODYNAMICS	16	CO1	Understand the fundamentals of thermodynamic systems and processes	2										
			CO2	Apply laws of the thermodynamics and principle of entropy to engineering devices.	2										
			CO3	Analyze various air standard cycles and their performance.	2										
			CO4	Evaluate the performance of fuels and combustion to various engines.											1
11HS209	Basics of Marketing for Engineers		CO1	Understand the concepts of marketing, factors influencing the consumer behavior, decision making process and strategic areas of 4Ps									1		
			CO2	Apply the insight earned about consumer psychology in improving the demand of the product in the market.									1		
			CO3	Analyze the markets and consumers, the changing environmental factors with special focus on technology products									1		

			CO4	Create an appropriate strategy for the marketing of high tech products and services							3					

K.L.UNIVERSITY

SCHOOL OF CIVIL AND MECHANICAL SCIENCES

Department of Civil Engineering

K L UNIVERSITY:

Vision

- To be a globally renowned university

Mission

- To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

VISION, MISSION, LONG TERM GOALS, SHORT TERM GOALS, PEO's PO's and GA's OF DEPARTMENT:

Vision

- To impart knowledge and excellence in Civil Engineering with global perspectives to the student community and to make them ethically strong engineers to build our nation.

Mission

- Our mission is to provide holistic development of student community to meet the ever changing needs of civil engineering industry and to be involved in forward looking research and consultancy useful to society.

B. Tech. - CIVIL ENGINEERING PROGRAMME

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

- To acquire, a strong foundation in basic sciences and technical knowledge, for successfully competing in executive positions and earn the highest qualification, in the field of Civil Engineering.
- To be a professional with high caliber in theoretical and practical applications in executing live projects with in-depth knowledge in CAD and analysis software packages.
- To possess strong application techniques with an understanding of multi-cultural, multi-linguistic, multi-disciplinary team work.
- To protect, sustainable development, environmental degradation and professional ethics.

PROGRAMME OUTCOMES (POs):

On completing the B. Tech. – Civil Engineering Programme successfully the students will exhibit the following capabilities:

a. Knowledge in Mathematics, basic sciences, problem solving skills, practical experience to enter career growth related to civil engineering.
b. Possessing practical knowledge in knowing the experiments that have to be conducted on site and in lab to ensure quality in construction.
c. Be a designer and analytical expert to design various structures based on the need.
d. Possessing field experience, design skills and abilities to shine as an independent Structural engineer / Foundation Engineer / Highway Engineer / Surveyor or any other specialization.
e. Apply Computer Aided Design practices to generate plan and elevation of buildings / structures of any shape.
f. Adopt new materials in the construction of buildings and other structures, without degrading the environment.

g. Competency in using BIS codes, International Specifications, Handbooks, Manuals and appropriate software packages for the application of Disaster mitigation techniques.
h. Understanding the three R's with respect to sustainable development and Environmental protection, i.e. Reduce, Reuse, and Recycle.
i. Rendering consultancy services independently, with respect to Civil Engineering applications.
j. Understanding the concepts of architectural needs, Socio economical issues and professional ethics as applicable to Civil Engineers.
k. Knowledge of project management and finance management.

K L UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERINGMAPPING OF PEOs *vs.* Mission Statement (Undergraduate)

		Mission Statement		
		To provide holistic development of student to meet the ever changing needs of civil engineering industry	**To be involved in forward looking research**	**To be involved in consultancy useful to society**
	Programme Educational Objectives			
1	Practice engineering in a broad range of industrial, societal and real world applications.	**√**	**√**	**√**
2	Practice engineering in a broad range of industrial, societal and real world applications.	**√**	**√**	**√**
3	Practice engineering in a broad range of industrial, societal and real world applications.	**√**	**√**	**√**
4	Practice engineering in a broad range of industrial, societal and real world applications.	**√**		**√**

K L UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING

MAPPING OF POs *vs.* PEOs (Undergraduate)

		Programme Educational Objectives			
		Practice engineering in a broad range of industrial, societal and real world applications.	Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.	Conduct themselves in a responsible, professional, and ethical manner.	Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.
	Program Out Comes				
1	Ability to apply knowledge of mathematics, science, and engineering	**√**		**√**	
2	Ability to design and conduct experiments, as well as to analyze and interpret data	**√**			
3	Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and	**√**	**√**		

	sustainability				
4	Ability to function on multidisciplinary teams	√			
5	Ability to identify, formulate, and solve engineering problems	√	√		
6	Understanding of professional and ethical responsibility	√		√	√
7	Ability to communicate effectively	√			
8	Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	√		√	√
9	Recognition of the need for, and an ability to engage in life-long learning	√	√		
10	Knowledge of contemporary issues	√	√		
11	Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	√			

K L UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING

MAPPING OF Courses & Cos *vs.* POs (Undergraduate)

Course Code	Course Title	CO NO	Description of the Course Outcome	a	b	c	d	e	f	g	h	i	j	k
13HS101	ENGLISH	CO1	Kinesics: To enable the students with the study of body language as it is an essential component of soft skills.	1										
		CO2	Lexis: Vocabulary building	1										
		CO3	English usage and mechanics: Grammar and verbal reasoning					2						
		CO4	Office communication to improve learning skills					2						
13HS102	LANGUAGE AND REASONING SKILLS	CO1	Understand the method of identifying the meaning of words and apply them in contexts.							2				
		CO2	Understand and analyze different cultures and the importance of empathy in cross-cultural communication.						2					
		CO3	Understand and analyze seven techniques of reading and improve reading speed.							2				
		CO4	Understand and apply writing strategies in office/ formal communication							2				

11BS105	ECOLOGY AND ENVIRONMENT	CO1	Understand the importance of Environmental education and conservation of natural resources								1			
		CO2	Understand the importance of ecosystems and biodiversity.									1		
		CO3	Understand the knowledge on solid waste management										1	
		CO4	Understand the knowledge on disaster management and EIA process										1	
13HS104	HUMAN VALUES	CO1	realize and understand the basic aspiration, harmony in the human being.						1				1	
		CO2	envisage the roadmap to fulfill the basic aspiration of human beings.	2				2						
		CO3	Aanalyze the profession and his role in this existence.						2				2	
		CO4	Develops holistic perception by understanding harmony in nature						2				2	
13BS101	LINEAR ALGEBRA AND MULTIVARIATE CALCULUS	CO1	Perform elementary operations on matrices including determination of rank and inverse, demonstrate mastery in using matrix algebra to find the solution to a linear system equations, iterative methods: Jacobi's method and Gauss - Seidal method .Determine the eigen values and eigen vectors, Cayley-Hamilton theorem and its applications, nature of the quadratic forms	2	2			2						

		CO2	Interpret and apply differential calculus on problems involving rate of change. Explain the geometrical interpretation and applications of Rolle's theorem and mean value theorems.Analyze the maximization and minimization problems.	2	1			2							
		CO3	Illustrate the applications of integral calculus in solving problems on area, volume, displacement, work, etc. Computing improper integrals, Beta, Gamma functions and their properties. Compute multiple integrals by changing the order of integration and change of variables such as polar, spherical and cylindrical coordinates.	2	2			2							
		CO4	Determine gradient, divergence and curl of vector point functions with their properties. Calculate the line, surface and volume integrals, Green's, Gauss divergence and Stoke's theorems and their applications.	2	2			2							
13BS102	DIFFERENTIAL EQUATIONS	CO1	Describe different situations required to model differential equations. Classify the differential equations and identify suitable solution techniques	2	2										
		CO2	Illustrate modeling an engineering problem as a first order ordinary differential equation (ODE) and solving it using numerical methods available viz. Taylor, Euler, modified Euler and Runge-Kutta method	2	1										
		CO3	Analyze engineering problem solutions in particular electric circuits, deflection of beams, free oscillations, forced oscillations and resonance through differential equations	2	2										
		CO3	Illustrate to model an engineering problem second order PDEs namely one dimensional wave and heat equations, two dimensional Laplace equation into PDEs and find their general solutions using C.F and	2	2										

			P.I.												
13BS103	ENGINEERING PHYSICS	CO1	Explain how ultrasonic waves are produced and detected, Determine flaws present inside a material using NDT techniques.	1											
		CO2	Compute the magnetic induction produced by current carrying conductors by using Biot-Savart law & Ampere's law, Compute the Lorentz force experienced by a charged particle.	1											
		CO3	Understand different aberrations in lenses and their corrections, phenomenon of interference in thin films of uniform thickness	1											
		CO4	Explain the working of optoelectronic devices like LED, photodiode, photo transistor and solar cells, Explain the phenomenon of superconductivity and its applications	1											
11BS104	ENGINEERING CHEMISTRY	CO1	Examine water quality and select appropriate purification technique for intended problem		2	2									
		CO2	Predict potential complications from combining various chemicals or metals in an engineering setting		2	2									
		CO3	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena		2	2									
		CO4	Apply phase rule, polymers, conducting polymers and nano chemistry to engineering processes			2									
		CO5	An ability to analyze & generate experimental skills		2	2									

13BS201	MATHEMATICAL METHODS	CO1	Identify different mathematical problems and reformulate them to facilitate numerical treatment using an appropriate technique.	2											
		CO2	Apply Fourier series, Fourier transforms and Z-transforms to analyze various signals.	2											
		CO3	Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance and to estimate unknown parameters of populations and apply the tests of hypotheses.	2											
13ES103	ENGINEERING MATERIALS	CO1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.	1											
		CO2	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.	1											
		CO3	Understands role of molecular vibrations in determining thermal properties of materials and deformation of materials in response to action of load, for identification of materials having specific engineering applications.	1											
		CO4	Understands spin and orbital motion of electrons in determining magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.	1											
13ES102	MEASURMENTS	CO1	Understand and apply the fundamentals of a measurement system, characteristics, transducers and metrology using simulation and experimentation tools.	2	2										

		CO2	Understand various electrical & computer parameters, and apply different measuring techniques on various electrical parameters using simulation and experimentation tools.	2	2									
		CO3	Understand electronic & electro-physiological parameters, and apply measuring techniques on electronic parameters using simulation and experimentation tools.	2	2									
		CO4	Understand and apply different measuring techniques on civil and mechanical parameters using simulation and experimentation tools.	2	2									
11ES104	ENGINEERING GRAPHICS WITH CAD	CO1	Draft Orthographic views, projections of planes and , solidsmanually and by using CAD software Tool (AutoCAD)					2						
		CO2	Drafting Sectional views , Isometric views manually and by using AutoCAD					2						
		CO3	Development of surfaces and perspectives views manually and by using AutoCAD					2						
13ES105	WORKSHOP PRACTICE	CO1	Project based workshop to prepare different models with the aid of workshop trades i.e., Carpentry and Tin smithy											2
		CO2	Project based workshop to prepare different models with the aid of workshop trades i.e.,House wiring and Fitting											2
		CO3	Project based workshop to prepare different models with the aid of workshop trades i.e.,Fitting											2
13ES101	PROBLEM SOLVING THROUGH	CO1	Illustrate how problems are solved using computers and programming.	2				2						

	PROGRAMMING	CO2	Interpret & Illustrate user defined C functions and different operations on list of data.	2				2						
		CO3	Implement Linear Data Structures and compare them.		2									
		CO4	Implement Binary Trees.		2									
13ES106	ENGINEERING MECHANICS	CO1	Understand the concept of forces and apply the static equilibrium equations.	1				2						
		CO2	Analyze co-planar and non co-planar system of forces.	2				2						
		CO3	Apply the concept of centroid & centre of gravity to determine moment of inertia.	2				2						
		CO4	Analyze the rigid bodies under translation and rotation with and without considering forces.	2				2						
13ES201	THERMODYNAMICS	CO1	Apply first law of thermodynamics to non flow systems	2				2						
		CO2	Apply steady flow energy equation and second law of thermodynamics to various processes and engineering devices	2				2						
		CO3	apply principle of entropy and thermodynamic relations to thermodynamic system and process	2				2						
		CO4	Evaluate the performance of Otto, Diesel, Dual cycles and Refrigeration cycles	2				2						

13ES202	OBJECT ORIENTED PROGRAMMING	CO1	Understand Basic Concepts of OOP and apply the concepts of classes and objects through Java Language.	2				2						
		CO2	Apply the concepts of constructors, Overloading, parameter passing, access control, Inheritance.	2				2						
		CO3	Apply Packages, Interfaces, Exception Handling.	2				2						
		CO4	Apply I/O Streams and understand Basic Concepts of Multi –Threading	2				2						
		CO5	Develop programs and projects in Java.	2				2						
13ES203	NETWORK THEORY	CO1	Understand the VI characteristics of electrical elements, solution of complex problems of DC circuits using transformations, nodal, mesh analysis and theorems	1	1									1
		CO2	Understand the fundamentals and interconnection relations of 3 – phase circuits	1										1
		CO3	Analyze the series and parallel resonance and magnetic circuits	2	2									2
		CO4	Analyze the transient analysis of DC / AC circuits, two port networks and solve complex networks using topology	2	2									2
13ES204	DATA STRUCTURES	CO1	Student will be able to apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.	2				2						

		CO2	Student will be able to analyze and compare linear data structures and analyze different searching and hashing techniques.	2				2							
		CO3	Student will be able to analyze and compare various non – linear data structures like Trees and Graphs.	2				2							
		CO4	Student will be able to analyze and compare various sorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.	2				2							
		CO5	Student will be able to understand and execute lab experiments and develop a project along with his/her team members.		2										
13ES205	SIGNAL PROCESSING	CO1	Understand the representation, manipulation and processing operations of DT signals and systems					1							
		CO2	Interpret the analysis of DT systems using Z.T.					2							
		CO3	Apply the Fourier Transformation techniques for DT sequences and their applications.					2							
		CO4	Ability to design, Implementation and realization of digital filters.					2							
		CO5	Design and Implementation of the Signal processing algorithms in Matlab.												3

13-CE201	MECHANICS OF MATERIALS	CO1	Determine SF and BM and draw SFD and BMD for determinate beams.		2									
		CO2	Determine bending stresses and shear stresses in beams.		2									
		CO3	Determine Transformation of stresses from one axis to another axis. Analysis and design of shafts		2									
		CO4	Analyze Buckling of columns by various methods and analysis of thin cylinders		2									
13-CE202	FLUID MECHANICS	CO1	Understand various properties of fluids and apply various laws for measuring pressure					2						
		CO2	Apply the laws to measure total pressure and center of pressure on surfaces and understand the concepts of Buoyancy and flotation					2						
		CO3	Apply continuity equation, stream function and velocity potential function for fluid flows and apply Bernoulli's equation to various fluid flow applications					2						
		CO4	Estimate the major and minor losses in flow through pipes and understand the concepts of dimensional analysis and boundary layers.					2						
		CO5	Apply the theoretical concepts to conduct various experiments of fluid flow practically and analyze the data.		2									
13CE205	Surveying	CO1	Apply the knowledge of plane surveying for computation of angles in a traverse	**2**				**2**						

		CO2	Calculate the differences in elevation using differential levelling techniques and preparation of contour plan	**2**				**2**						
		CO3	Computation of areas of field and volume of earthwork	**2**				**2**						
		CO4	Apply the knowledge of theodolite and tacheometric survey, and total station for calculation of height of building											**2**
15 CE 2104	Structural Analysis	CO1	Determine the deflection of determinate beams	**1**				**2**						
		CO2	Analyse indeterminate Propped cantilever and fixed beams	**1**				**2**						
		CO3	Analyse indeterminate continuous beams and portal frames	**1**				**2**						
		CO4	Analyse Continuous beams and portal frames by moment distribution method.	**1**				**2**						
13-CE204	HYDRAULICS AND HYDRAULIC MACHINES	CO1	Design open channels for most economical sections like rectangular, trapezoidal and circular sections	2		2								
		CO2	Understand Gradually Varied flow and Rapidly Varied Flow though the channels and its applications	2		3								
		CO3	Understand the mechanics of impact of jet on various types of vanes and components, function and also design of Pelton Turbine	2		2								
		CO4	Design of Reaction Turbines and pumps	2		2								

		CO5	Demonstrate and calculate the dimensions of channels and hydraulics machines												3
13CE206	Soil Mechanics	CO1	Analyze the physical and engineering properties of soils, and classification of soil and Analyze the compaction requirement in the field, and field compaction control	**2**											
		CO2	Analyze the effective stress variation and seepage by conducting the appropriate laboratory or field tests	**2**		**2**									
		CO3	Analyze the stresses in the soil due to super structure loads, and settlements due to these loads	**2**		**2**									
		CO4	Analyze shear strength of soil and analyze and interpret the laboratory and field tests required for any geotechnical investigation	**2**		**2**									
		CO5	Analyze and interpret the physical and engineering properties of soil by performing the required laboratory tests for any geotechnical investigation		**2**					**2**					
13-CE207	Environmental Engineering	CO1	understand various aspects related to water supply process and design of water treatment system	**2**											
		CO2	Design and laying of distribution system and understand the basics of air Pollution					**2**							
		CO3	Assess sewage quantity and design of sewerage system		**2**										
		CO4	Design of sewage treatment process and understand basics of noise pollution and solid wastes.					**2**							

		CO5	Test the water & wastewater, design of water, wastewater treatment plant& distribution system	**2**				**2**							
13CE208	BUILDING PLANNING AND CONSTRUCTION	CO1	Understand the types of buildings and Applying building bye-laws for planning of buildings.									2			
		CO2	Understand about the concept of different types of masonry and flooring									2			
		CO3	Understand the types of floors, roofs, arches and weathering courses.									2			
		CO4	Understand the different types stairs, building components and types of form work for building components									2			
		CO5	Understand the importance of experiments through Auto Cad software and apply knowledge experiments in the project based laboratory									2			
13CE301	Construction Materials and Concrete Technolgy	CO1	Compare the properties of most common and advanced building materials	2				2							
		CO2	Understand the typical and potential applications of these materials such as concrete and its mix proportioning	2				2							
		CO3	Understand the relationship between material properties and structural form	2				2							
		CO4	Understand the importance of experimental verification of material properties.	1				1							1
13CE302	Engineering Geology	CO1	Understand various geological processes operate on the surface of the earth, impact of the processes on	2	2			2							

			the construction materials.												
		CO2	Understand the formation of different types of rocks and their identification and properties and use in sourcing suitable geological materials for construction	2				2							
		CO3	Equip with factors leading to various geological hazards and able to identify areas vulnerable to sliding, come out measures to stabilize slopes and seismic vulnerability.	2		2		2							
		CO4	Equip with basic knowledge required for identification of suitable site for the proposed construction project, Equip with basic knowledge of hydro geological properties of rocks, identification of potential pockets for tapping groundwater and geological settings that are un favorable / unsafe for construction of dams and driving the tunnels.	2		2		2							
13CE303	Transportation Engineering	CO1	Design various geometric elements and significance of Transportation Engineering and Its development in world and in india,	**2**											
		CO2	Analyze and Design of Flexible Pavements and rigid pavements	**2**											
		CO3	Understand Highway Construction equipment & Necessesary Highway Drainage and Maintenance.	**1**											
		CO4	Analyze and Design Traffic Infrastructure Facilities.	**2**											
		CO5	Testing and Specification of Pavement Materials												**2**

13CE304	Foundation Engineering	CO1	Carry out geotechnical field investigation and can prepare field reports and Thoroughly understand different geotechnical investigation methodologies and can handle individually	2				2						
		CO2	Can compute stress distribution using different techniques and can carry settlement analysis in different soil types	2				2						
		CO3	Compute bearing capacity of shallow and deep foundations in laboratory and field using different methods	2				2						
		CO4	Can analyze stability of slopes for finite and infinite in different soil conditions and methods, Carry earth pressure analysis and can design retaining walls	2				2						
13CE305	Design of Reinforced Concrete Structures	CO1	Design singly reinforcement beam using LSD			**2**								
		CO2	Design concepts of shear, development length and torsion for beams			**2**								
		CO3	Design reinforced concrete slabs and columns			**2**								
		CO4	Design isolated footings and stair cases			**2**								
		CO5	Design and Detailing of structural elements (Beams, columns, Slabs, footings and staircases) using software tool in limit state method.											**3**
13CE306	Design of Steel Structures	CO1	Analyse and design bolted and welded connections	2		2		2						

		CO2	Design single and compound beams as per IS code	2		2		2						
		CO3	Design simple and built-up columns as per IS code	2		2		2						
		CO4	Design column base systems as per IS code, Calculate wind forces and design roof trusses	2		2		2						
13CE307	WATER RESOURCES ENGINEERING	CO1	Estimation of Precipitation, Surface and Sub surface runoff using various techniques	2	2	2								
		CO2	Estimation of Irrigation and ground water requirement for suggest Irrigation methods based on crops,	2	2	2								
		CO3	Analyze the Irrigation channels and Reservoir Planning	2	2	2								
		CO4	Analyze stability of Earth and Gravity Dams	2	2	2								
13TP401	TERM PAPER						3							
13PS401	Practise School						3							
13CE308	ADVANCED STRUCTURAL ANALYSIS	CO1	analyze the determinate structures for various loads and load combinations	2				2						
		CO2	analyze the indeterminate structures using matrix methods	2				2						

		CO3	analyze cabled structures and hinged arches	2				2							
		CO4	analyze indeterminate beams and frames using Plastic Analysis	2				2							
		CO5	analyze Beams, Frames (Portal Frame, Space Frame), Trusses by using STAAD.Pro V8iand ETABSsoftwares												3
13-CE309	Advanced Design of Reinforced Concrete Structures	CO1	Apply Limit state design method, Design of R.C.C Staircases and Ductile detailing	**3**		**3**									
		CO2	Design of flat slabs, post tensioned structural components and shear walls			**3**									
		CO3	Design shallow and deep Foundations			**3**									
		CO4	Design of precast buildings			**3**									
		CO5	Design and detailing Staircases, Flat slab, Shear walls, Mat foundation, Piles and under reamed piles	**2**				**2**							
13 CE 402	Quantity Surveying and Estimation	CO1	Understand the fundamentals of estimation and provide hands on experience on estimation of quantities of building.	2				2							
		CO2	Prepare detailed estimate of quantities and costs for R.C.C structures, Roads, Canals	2				2							
		CO3	Prepare detailed specifications and provide exposure to rate analysis for different items of work.	2				2							

		CO4	Recognize the P.W.D working procedures, Contracts and tenders of a project and carry out building valuation.	2				2							
		CO5	Practical estimations of buildings, road works etc. by using a software package (M.S Excel)												3
13CE331	GREEN BUILDINGS	CO1	Understand Necessity and Role of Green Buildings & Regarding Indian Green Building Council	2											
		CO2	Understand the usage of Water, Site and Material Parameters.												2
		CO3	Understand Passive Solar Design & Economics of a Green Buildings												2
		CO4	Understand Construction and Maintenance of Green Buildings												2
13CE333	Earth quake Resistant Design of Structures	CO1	Understand the building categories, seismic behavior and dynamics of structures	**1**				**1**							
		CO2	Understand the earthquake causes, ground motion behavior, Seismic resistant building architecture	**1**				**1**							
		CO3	Understand about the Foundations of different structures, Quality of construction materials, Quality of concrete, general detailing requirements		**1**			**1**							
		CO4	Analyze an Earthquake resistant structure 2-storied structure based upon the upcoming forces onto the structure because of the seismic condition.		**2**			**2**							
13CE334	PRESTRESSED CONCRETE	CO1	Understand the concepts of prestressed concrete and analyze the prestressed concrete beams .	2				2							

		CO2	Analyze losses in prestressed concrete and deflection of the prestressed concrete members.	2				2							
		CO3	Design reinforcement for Ultimate shear ,torsion and bending of prestressed concrete members.	2											
		CO4	Design end blocks as per IS 1343 recommendations.		2										
11CE335	Bridge Engineering	CO1	Introduction to different types of bridges and codal provisions for designing the bridge components .	2		2		2							
		CO2	Analysis and Design of slab Culvert.	2		2		2							
		CO3	Analysis and Design of T-Beam, sub-structure components and bearings	2		2		2							
		CO4	Understanding the designing of cable supported bridges.	2		2		2							
13CE341	GROUND IMPROVEMENT TECHNIQUES	CO1	Able to apply different Stabilization Techniques for the ground improvement			2									
		CO2	Able to apply diiferent dewatering techniques for the drainage in clays			2									
		CO3	Able to apply different grouting techniques and use various geosynthetics for ground improvement			2									
		CO4	Able to analyze the stability of earth reinforced wall			2									

13CE342	Advanced Foundation Engineering	CO1	Design of foundation in swelling soils	**2**		**2**								
		CO2	Design of spread footings and factors	**2**		**2**								
		CO3	Design of rectangular, trapezoidal, and strap footings	**2**		**2**								
		CO4	Design and Analyze of Mat foundations and machine foundations	**2**		**2**								
13-CE343	Geological Earthquake engineering	CO1	Analyze the seismic hazards and Study of Seismology			**3**								
		CO2	Study of soil properties and ground motion generation			**3**								
		CO3	Study of Ground response analyis and local site effect parameters			**3**								
		CO4	Study of soil improvement remediation of Seismic hazards and liquefaction propert			**3**								
13-CE344	Design Of Earth Reataining Structures	CO1	Analyze and design of Retaining walls		**2**									
		CO2	Analyze and design of Sheet pile Structures		**2**									
		CO3	Analyze the Braced cuts and applications of Soil Reinforcement		**2**									

		CO4	Analyze the Cofferdams		**2**									
13-CE361	Railway, Airport and Dock & Harbour Engineering	CO1	Interpret historical Components of Railway Engineering.	**1**										
		CO2	Understand about the Railway Track Geometric Elements and Turnouts	**1**										
		CO3	Design geometric elements of Airport Runway and Taxiway											**2**
		CO4	To study about various components of docks and harbours	**1**										
13-CE362	Advanced Highway Engineering	CO1	Analyze and design hill roads including their maintenance	**3**										
		CO2	Analyze and design Low Volume Roads including quality control aspects	**3**										
		CO3	Dealt with Desert Roads, Roads in Swampy, water-logged areas and in Black cotton Soil					**2**						
		CO4	Versatile with various components of Special Roads such as Expressways, Toll Roads, Urban Roads.			**2**								
13CE 363	Traffic Engineering	CO1	To understand knowledge of traffic flow characteristics	**2**										
		CO2	Analyze the traffic infrastructure facilities	**2**										

		CO3	Categorize Evaluation Procedures and Environmental Areas and effect of traffic on environment and measures	**2**											
		CO4	Distinguish traffic safety and its management measures	**2**											
13-CE-364	Advanced Pavement Design Engineering	CO1	understand about the characteristics of pavement materials and bituminous mixes.	**1**											
		CO2	understand the Applications of various Pavement methodologies in the design pavements.	**1**											
		CO3	Analyze and Design Highway Flexible Pavements	**1**	**2**										
		CO4	Analyze and Design Airport flexible, Rigid Pavements	**1**	**2**										
11-CE-439	Urban Transportation Systems Planning	CO1	Understand the role, purpose of urban transportation planning and to know the characteristics of components involved in planning of urban transportation systems.	**1**											
		CO2	Understand the Four stage modelling approach, Trip generation and distribution concepts and their application					**2**							
		CO3	Understand the concepts of Modal split and traffic assignments and their applications					**2**							
		CO4	Gain knowledge about the concepts of public transport planning, Intermediate para transit and Intelligent Transportation Systems	**1**											

13AC201	ENERGY AND SOCIETY	CO1	Understand the various forms of available energy and energy related aspects.								1		1	
		CO2	Apply energy auditing methodology to estimate energy conservation of different case studies.								2		2	
		CO3	Understand the environmental and geological impacts on the energy vice versa.								1		1	
		CO4	Apply the planning and controlling aspects for economical energy usage.								2		2	
13AC301	ADVANCED EMPLOYABILITY SKILLS	CO1	Understand and adopt appropriate behavior patterns		1									
		CO2	Understand ,remember and apply lexical, syntactic skills related to grammar, usage and composition					2						
		CO3	Analyze and apply various interpersonal skills in day-to-day communication					2						
		CO4	Understand, learn and apply .the principles of various types of GDs and Personal Interviews					2						
11OE408	IPR & PATENT LAWS	CO1	Recognise the importance of Intellectual property rights	**1**										
		CO2	Discuss and describe principles, scope and functions of GATT & WTO	**1**										
		CO3	Understand and summarise regulatory affairs	**1**										

		CO4	Prepare Documentation and protocols; case studies on patents	**2**											**2**
11OE309	REMOTE SENSING AND GIS	CO1	To understand the basic concepts of remote sensing and image processing.	**1**											
		CO2	To understand the basic concepts of Geographical Information System	**1**											
		CO3	To acquire the knowledge of Integrating the Remote sensing and GIS	**1**											
		CO4	To apply the remote sensing and GIS tool for solving various civil engineering and societal problems	**2**											
11 - OE414	DISASTER MANAGEMENT	CO1	Understand the types of disasters, related hazards and the causes for disasters	**1**											
		CO2	Apply the resilience and mitigation measures for various disasters by proper planning with respect to the kind of disaster that occur .		**2**										
		CO3	Understand the disaster risk, reduction and the various organisations involved with related to disasters.		**1**										
		CO4	Understand the disaster vulnerability with the help of case studies		**1**										
11OE426	RENEWABLE ENERGY RESOURCES	CO1	Understand the different solar thermal applications and solar photovoltaic cells	**1**								**1**			
		CO2	Understand the operation of wind turbine ,different types of wind turbines and wave energy conversion	**1**								**1**			

		CO3	Understand the energy conversion of Tidal, ocean thermal and various the geo thermal power plants	**1**								**1**			
		CO4	Analyze the operation of Bio energy conversion methods and the different bio gas plants	**2**								**2**			
12OE442	MECHATRONICS	CO1	Identify appropriate sensors, Identify appropriate actuation system for a given application.			**2**									
		CO2	Identify appropriate microcontroller for a given application and to build a mathematical Model of system for evaluating open Loop system performance and behavior.					**2**							
		CO3	Suggest an appropriate closed loop control strategy to attain the desired system behavior					**2**							
		CO4	Suggest a Mechatronic product design for a given application and evaluate its performance.				**3**								
12OE443	ROBOTICS	CO1	Analyze existing robotic systems with respect to their anatomy, type, performance specifications, end effectors etc.			**2**									
		CO2	Suggest a robotic system design with respect to the suitable sensors, actuators for an intended application and simulate its performance	**3**											
		CO3	Analyze robot manipulator performance with respect to digital control architecture comprising of PLC's /Microcontroller for an application			**2**									
		CO4	Comprehensive understanding and identification of suitable Robotic system	**2**											

11OE433	E-COMMERCE	CO1	Understand the E-Commerce revolution ,infrastructure and Analyze various E-Commerce Business Models											**2**	**2**
		CO2	Analyze Building an E-Commerce website and focus on security, payment systems and Marketingconcepts.											**2**	**2**
		CO3	Analyze Marketing communications and understand the Ethical, Social and Political issues in E-Commerce											**2**	**2**
		CO4	Analyze the supply chain management, Internet resources and applications for E-Commerce											**2**	**2**
13OE429	FUNDAMENTALS OF INFORMATION TECHNOLOGY	CO1	Understand the architectural design of a computer and various basic concepts of operating systems and programming fundamentals	**1**											
		CO2	Analyze various software development methodologies and gain capability to design databases.	**2**				**2**							
		CO3	Apply various SQL commands and Transaction Processing.	**2**				**2**							
		CO4	Apply OOP and model for different case studies using UML	**2**				**2**							
13OE421	LINUX PROGRAMMING	CO1	Understand the fundamental LINUX operating system and utilities.					**1**							
		CO2	Develop shell scripts for solving logical problems												**2**

		CO3	Analyze the file System, Processes and Signals concepts					**2**							
		CO4	Develop programs using various IPC mechanisms												**2**
11 OE 431	RADAR SYSTEMS	CO1	Understand the essential principles of operation and design of simple radar systems and the associated signal processing, at block diagram level.					**1**							
		CO2	Apply the mathematical models relavent to radar systems to calculate system performance and apply the principles of tracking Radars					**2**							
		CO3	Understand essential elements of Transmitters , Receivers and design of simple Radar Receiver					**1**							
		CO4	Understand the concepts of different elements that protect the Radar Receives and Principles of various Synthetic Aperture Radars	**1**											
11-OE-422	OPTICAL ENGINEERING	CO1	Understand the basics of Light signals and different types of Optical Engineering methodologies	**1**											
		CO2	Analyze the concepts of transmission characteristics of optical fibers and optical transmitters					**2**							
		CO3	Understand the concepts of optical Detectors, optical Sensors and their applications	**1**											
		CO4	Analyze the concept of optical fiber systems and instruments					**2**							
11-OE-424	MOBILE COMMUNICATIONS	CO1	Describe various 2G,3G,4G,5G wireless network models.	**2**											

		CO2	Explain three basic propagation mechanism .	**2**										
		CO3	Discuss wireless system standards,gsm services	**2**										
		CO4	Discuss ofdm wireless communication					2						
11OE432	DATA WAREHOUSING AND MINING	CO1	Understand basic concepts of Databases and issues related to Data mining.										1	
		CO2	Analyze Data warehouse Architecture and Data Pre-processing techniques										2	
		CO3	Analyze Association rules in large data bases , Classification and Prediction techniques											2
		CO4	Analyze Clustering techniques on large data bases										2	
12OE445	FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS	CO1	Understand the fundamentals of database management systems.	1										
		CO2	Construct database tables using SQL		2									
		CO3	Analyze various normalization techniques and develop procedures and functions in PL/SQL		2									
		CO4	Understand the file storage structures in the Database Management and transaction processing.		1									

13-OE475	MEASURMENTS AND INSTRUMENTATION	CO1	Understand the basic principles of Measurement Systems.					1						
		CO2	Explore the Transducers and their classification.					1						
		CO3	Elucidate the basic principles of Signal conditioning & signal analyzers.					1						
		CO4	Understand Digital systems& Recording systems.					1						
13 OE 432	ANIMATION FOR ENGINEERS	CO1	Understand about 3D interface environment and its functioning	1										
		CO2	Apply primitive level 3d Models									2		
		CO3	Apply basic 3d animation video with 3d elements.	2										
		CO4	Apply basic 3d animation					3						
13OE433	PHOTOGRAPHY	CO1	Demonstrate the photography history and changes in technology.					1						
		CO2	Determine different Camera components and techniques involved in Basic Photography					2						
		CO3	Identify the different dynamic methods of image making using light.					1						

		CO4	Applying basic methods of photography for Engineering problems.					2						
11HS 202	PARADIGMS IN MANAGEMENT THOUGHT	CO1	Understand the basic management concepts along with an insight into levels of management									1		
		CO2	Understand the key contributions of classical approach to Management									1		
		CO3	Understand and apply Quantitative methods to improve Management performance.									1		
		CO4	Understand the key contributions of Behavioural and contemporary approaches to Management										1	
11-HS-203	INDIAN ECONOMY	CO1	To have an understanding on various types of economic systems and their functioning, circular flow of economic activity, also the nature and features of Indian economy.	1										
		CO2	To have an understanding on problems like un employment, poverty, and agricultural sector and industrial sectors		1									
		CO3	To understand the importance of territory sector	1										
		CO4	To know about economic planning in our Indian economy		1									
11-HS-208	MANAGING PERSONAL FINANCE	CO1	Understand the need for effective financial planning	1	1									

		CO2	Apply tax planning strategies to meet the Personal Financial goals.		2	2								
		CO3	Evaluate strategies adopted for Home, Automobile, Equity and Bond investments.		3	3								
		CO4	Evaluate various financial tax saving schemes such as insurance and mutual funds.	3		3								
11 HS 209	BASICS OF MARKETING FOR ENGINEERS	CO1	Understand the concepts of marketing, factors influencing the consumer behavior, decision making process and strategic areas of 4Ps		1									
		CO2	Apply the insight earned about consumer psychology in improving the demand of the product in the market.		2									
		CO3	Analyze the markets and consumers, the changing environmental factors with special focus on technology products		2									
		CO4	Create an appropriate strategy for the marketing of high tech products and services		3									
11HS211	ORGANIZATION MANAGEMENT	CO1	Understand the various management theories and management approaches.	1		1								
		CO2	Have knowledge in organization structures and organization principles.	1		1								
		CO3	Have basic knowledge in motivation, motivation theories and leadership theories, moral and behavioral sciences and also understand the management concept, administration and management objectives.	1		1								

		CO4	Understand the various issues in industrial relations, trade unions and college bargaining	1		1									

K L University

Department of Electronics and Communication Engineering

Academic Year 2013-2014

Mapping of ECE Department Mission Statement with SOs, PSOs and PEOs

Program Outcomes

Mission statement of K L University:

Vision:

To be a globally renowned university.

Mission

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

Vision and Mission statement of ECE department

VISION

- To evolve into a globally recognized department in the frontier areas of Electronics & Communication Engineering (ECE).

MISSION

M1- To produce graduates having professional excellence.

M2- To carry out quality research having social & industrial relevance.

M3- To provide technical support to budding entrepreneurs and existing Industries**.**

PROGRAM EDUCATIONAL OBJECTIVES (PEOS)

- **PEO1:** Practice engineering in a broad range of industrial, societal and real world applications.
- **PEO2:** Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.
- **PEO3:** Conduct themselves in a responsible, professional, and ethical manner.

- **PEO4:** Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.

Student Outcomes

a	Ability to apply knowledge of mathematics, science, and engineering
b	Ability to design and conduct experiments, as well as to analyze and interpret data
c	Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d	Ability to function on multidisciplinary teams
e	Ability to identify, formulate, and solve engineering problems
f	Understanding of professional and ethical responsibility
g	Ability to communicate effectively
h	Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i	Recognition of the need for, and an ability to engage in life-long learning
j	Knowledge of contemporary issues
k	Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

Mapping of Mission statements with program educational objectives

	M1	M2	M3
PEO1	✓	✓	✓
PEO2	✓	✓	✓
PEO3	✓		✓
PEO4	✓	✓	✓

Mapping of PEOs with Pos

	PEO1	PEO2	PEO3	PEO4
a	✓	✓		
b	✓	✓		
c	✓	✓		
d	✓	✓		✓
e	✓	✓		
f			✓	✓
g	✓	✓		✓
h		✓	✓	✓
i	✓		✓	✓
j	✓			✓

k	✓	✓		

DEPARTMENT OF ELECTRONICS & COMMUNICATIONS ENGINEERING
K L UNIVERSITY
Green fields, Vaddeswaram, Guntur

MAPPING OF COURSES OUTCOMES WITH STUDENT OUTCOMES (2013 Regulations)

Sl. No.	Course Code	Course Title	SNO	CO NO	Description of the Course Outcome	a	b	c	d	e	f	g	h	i	j	k
1	13-HS 101	English	1	CO1	Understand the method of identifying the meaning of words from the context and form sentences using words.						2	2				
			2	CO2	Understand and analyze seven types of reading techniques and improve reading speed.						2	2				
			3	CO3	Understand and apply writing strategies for office/ formal communication.						2	2				
			4	CO4	Understand and analyze different cultures and the importance of empathy in cross-cultural communication.						2	2				
2	13-HS 10	Language and Reasoning Skills	1	CO1	Understand and analyze the depth of a topic and use the advanced levels in creative speaking and debating.						2	2				

	2		2	CO2	Understand and analyze various strategies involved in writing an essay and apply various styles in writing.						2	2						
			3	CO3	Understand and analyze the given text critically and answer questions on critical reasoning based on the given information.						2	2						
			4	CO4	Acquire knowledge on various employability skills & analyze a situation and develop adaptability.						2	2						
			5	CO5	Apply the Concepts of basic geometry and their importance while solving the problems.						2	2						
3	11-BS105	Ecology & Environment	1	CO1	Understand the importance of Environmental education and conservation of natural resources.								2		2			
			2	CO2	Understand the importance of ecosystems and biodiversity.								2		2			
			3	CO3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process.								2		2			
4	13-HS104	Human Values	1	CO1	Understand and identify the basic aspiration of human beings						2							
			2	CO2	Envisage the roadmap to fulfill the basic aspiration of human beings.						2							
			3	CO	Analyze the profession and his role in this existence.						2							

				3													
5	13-BS 103	Engineering Physics	1	CO1	Understand the concepts of crystallography and crystalline imperfections in order to determine crystal structures and to identify defects in crystals	2											
			2	CO2	Understand electrical and optical properties of materials and apply them to know various mechanisms involved in electrical, electronic, optical, optoelectronic devices.		2										
			3	CO3	Understand mechanical and thermal properties of materials and apprehend their importance in identification of materials for specific engineering applications		2										
			4	CO4	Understand magnetic properties of materials and apply them to know various mechanisms involved in magnetic memory devices and transformers.	2											
			5	CO5	Understand various properties of materials and apply the knowledge to execute the related experiments to get hands on experience and also to develop some inter disciplinary projects.	2	2										
6	11-BS 104	Engineering Chemistry	1	CO1	Predict potential complications from combining various chemicals or metals in an engineering setting.	2											
			2	CO2	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena.		2										

			3	CO3	Examine water quality and select appropriate purification technique for intended problem.	2													
			4	CO4	Apply phase rule, polymers, conducting polymers and nano chemistry to engineering processes.	2													
			5	CO5	An ability to analyze & generate experimental skills.		2												
7	13-ES 103	Engineering Materials	1	CO1	Understand the concepts of crystallography and crystalline imperfections in order to determine crystal structures and to identify defects in crystals	2													
			2	CO2	Understand electrical and optical properties of materials and apply them to know various mechanisms involved in electrical, electronic, optical, optoelectronic devices.	2													
			3	CO3	Understand mechanical and thermal properties of materials and apprehend their importance in identification of materials for specific engineering applications	2													
			4	CO4	Understand magnetic properties of materials and apply them to know various mechanisms involved in magnetic memory devices and transformers.	2													
			5	CO5	Understand various properties of materials and apply the knowledge to execute the related experiments to get hands on experience and also to develop some inter disciplinary projects.	2													

8	13-ES 102	Measurements	1	CO1	Understand and apply the fundamentals of a measurement system, characteristics, and metrology using simulation and experimentation tools.	1				1						
			2	CO2	Understand various electrical & computer parameters, and apply different measuring techniques on various electrical parameters using simulation and experimentation tools.	1										
			3	CO3	Understand electronic & electro-physiological parameters, and apply measuring techniques on electronic parameters using simulation and experimentation tools.					1						
			4	CO4	Understand and apply different measuring techniques on civil and mechanical parameters using simulation and experimentation tools.					1						
9	11-ES 104	Engineering Graphics with CAD	1	CO1	Draft orthographic Projections, Isometric views ,projection of planes, Manually and prepare Models in workshop by using drawings.											2
			2	CO2	Draftorhtographic projections ,isometric views , projection of planes using Autocad. Draft projection of solids Manually and by using AutoCAD and prepare Models in workshop by using different workshop trades											2
			3	CO3	Draft Development of surfaces of solid and sections of solid Manually											2
			4	CO4	Practicing house wiring through Auto Cad											2

			5	CO5	Develop 2D & 3D components using Auto Cad Software												2
10	13-ES106	Engineering Mechanics	1	CO1	Apply the concept of forces, governing static equations and analyze planer system of forces. Apply different analytical methods on spatial system of forces and analyzing them	2				2							
			2	CO2	Understanding the concepts of planar and non-planar system of parallel forces and analyzing them. estimate moment of inertia of lamina and material bodies		2										
			3	CO3	Analyzing the rigid bodies under translation and rotation with and without considering forces.		2										
			4	CO4	Understanding the engineering mechanics physical systems prepare and demonstrate the models with the help of mechanics concepts to solve the engineering problems					2							
			5	CO5	Apply the concepts of mechanics and carryout different experiments and analyze the results					2							
11	13-ES201	Thermodynamics	1	CO1	Understand the fundamentals of thermodynamic systems and processes	2				2							
			2	CO2	Apply laws of the thermodynamics and principle of entropy to engineering devices.					2							
			3	CO	Analyze various air standard cycles and their performance.	2											

				3													
			4	CO4	Evaluate the performance of fuels and combustion to various engines.					2							
			5	CO5	Apply the theoretical concepts to conduct various experiments of thermodynamics practically and analyze the data.	2											
12	13-ES202	Object Oriented Programming	1	CO1	Understand Basic Concepts of OOP, introduction to classes and objects through Java Language and apply.	2				2							
			2	CO2	Understand the concepts of constructors, Overloading, parameter passing, access control, Inheritance and apply.					2							
			3	CO3	Understand Packages, Interfaces, and Exception Handling and apply.	2											
			4	CO4	Understand I/O Streams & apply and understand Basic Concepts of Multi -Threading					2							
			5	CO5	Apply OOP concepts for developing an application	2											
13	13-ES203	Network Theory	1	CO1	Understand the circuit elements, kirchhoff's law and theorems to solve the networks	2										2	
			2	CO2	Apply the procedure to determine form factor and peak factor to different symmetrical & unsymmetrical waves.											2	

			3	CO3	Apply vector algebra to field fundamentals to analyze electric and magnetic field distributions	2											
			4	CO4	Apply Maxwell's equations for static and time varying fields												2
			5	CO5	Test and Analyze the concepts learned in fields and networks by conducting experiments or by any simulation softwares												2
14	13-ES205	Signal Processing	1	CO1	Understand the representation, manipulation and processing operations of DT signals and systems	2	2			2							
			2	CO2	Interpret the analysis of DT systems using Z.T.	2				2							
			3	CO3	Apply the Fourier Transformation techniques for DT sequences and their applications.	2				2							
			4	CO4	Ability to design, Implementation and realization of digital filters.		2			2							
			5	CO5	Design and Implementation of the algorithms in Matlab.					2							
15	13-EC201	Design of Electronic Systems	1	CO1	Design Basic Electronics Systems and circuits.	2				2							
			2	CO2	Design Basic amplifiers		2										

			3	CO3	Design linear amplifiers using op-amps.					2								
			4	CO4	Design basic applications of diode, BJT and JFET.	2												
16	13-EC202	Electromagnetic Field Theory	1	CO1	Apply the principles of vector calculus to estimate the static Electric fielddue to different sources.					2								
			2	CO2	Obtain the boundary conditions on E field and understand the conecpts of magnetic field to calculate the static H field due to different sources.					2								
			3	CO3	Develop the boundary conditions on H field and extend the concepts of static fields to obtain the governing laws of electromagnetic field.					2								
			4	CO4	Perceive the propagation of uniform plane wave and its characteristics in different media, and interpret the characteristics of the guided waves to understand the modes of propagation in rectangular Wave-guide.					2								
17	13-EC203	Basics of Digital Systems	1	CO1	Understand the representation of data using different codes and the principles of Boolean algebra to manipulate and minimize logic expressions	2												
			2	CO2	Analyze the functioning of different combinational logic circuits built with logic gates and the design procedure for developing circuits like adders, decoders, code converters, etc.					2								
			3	CO3	Analyze the behavior of flip-flops and the operation of sequential circuits using flip-flops					2								
			4	CO	Apply the design approach for creating sequential circuits like counters, shift registers, etc., and the concept of ASM charts in	2												

				4	describing the digital systems													
			5	CO5	Implement different combinational and sequential circuits with MyDaq instrument that develops the sufficient skills to build simpler electronic design projects					2								
18	11-EE 304	Control Systems	1	CO1	Students can be able to understand control system concepts such as open, closed loop systems, transfer function approach, mathematical modeling of physical systems and can understand analyze the similarities between synchros and ac generators					1								1
			2	CO2	Students can be able to Analyze the time domain and frequency response of physical systems													1
			3	CO3	Students can be able to understand and analyze stability of given transfer functions in time and Frequency domain and can be able to analyze the process of Converting state space equations into transfer function for the given model.					1								
			4	CO4	Students can be able to design and analyze controllers and lead, lag, lead-lag compensators													1
			5	CO5	Test and apply the knowledge obtained in the subject by Matlab or hardware.					1								
19	13-EC 20	Analog Electronic Circuits	1	CO1	Design different types of feed-back amplifiers and provide general solution for real time problems					2								

	5		2	CO2	Design different types of Oscillatorsand provide general solution for real time problems, and Design active filtersusing OPAMPs					2									
			3	CO3	Designother non-linear applications of OPAMPs such as precision rectifier, zero crossing detector, etc…, Designthe applications of 555timer					2									
			4	CO4	Analyze different types of Power amplifiers					2									
			5	CO5	Getting a Hands-on of various devices and circuits studied during the course (Lab and LTC) in all the COs					2									
20	13-EC 206	CMOS VLSI Design	1	CO1	Understand semiconductor device fabrication process.	2													
			2	CO2	Analyze the characteristics of CMOS circuits constructionand comparision between different state-of-the art CMOS technologies and prosesses.					2									
			3	CO3	Implement complete design verification process using computer automated tools for scaling,layout,extraction,simulation and timing analysis.					2									
			4	CO4	Verify a complete significant VLSI project and testing principles using CAD tools.	2													
21	13-EC	Analog Communicatio	1	CO	Understand the basic principles of linear modulation and demodulation techniques					2									

	207	n		1													
			2	CO2	Explore analog and pulse modulation and demodulation techniques.					2							
			3	CO3	Elucidate the basic principles of angle modulation and demodulation techniques					2							
			4	CO4	Analyze the basic analog transmitters and receivers in the presence of noise					2							
			5	CO5	Interpret and report on computer-based performance predictions of analog and pulse modulation systems.					2							
22	13-EC308	Digital Communications	1	CO1	Understand the fundamentals of digital communications and analyze the pulse digital communications, Matched filter performance,Inter Symbol Interference.	3				3							
			2	CO2	Demonstrate about Nyquist channel, Signaling Schemes and Signal Space Analysis.					3							
			3	CO3	Analyze pass band data transmission and Comparison of different M-ary schemes.	3											
			4	CO4	Performance Analysis of digital modulation schemes using single carrier.					3							
			5	CO5	Design and Simulate the Base band and Band pass modulation schemes.		3										

23	13-EM201	Computer Organization	1	CO1	Understand the logical gates to construct combinational & sequential circuits to perform arithmetic µ-operations.	3				3					3
			2	CO2	Develop micro Programs for design of Control Unit,CPU		3								
			3	CO3	Analyze and realize operations like Multiplication, Floating Point algorithms using supporting modern engineering tools.					3					
			4	CO4	Understand the Peripherals, I/O interface and Direct Memory Access.										3
			5	CO5	Design and Simulation of System Design using Logisim Tool.		3								
24	13-CS205	Computer Networks	1	CO1	Understand OSI and TCP/IP models					3					
			2	CO2	Analyze MAC layer protocols and LAN technologies										3
			3	CO3	Implement routing and congestion control algorithms										3
			4	CO4	Understand application layer concepts					3					
			5	CO5	Design applications using internet protocols										3

25	11-EC311	Micro-Processors & Micro Controllers	1	CO1	Understand the working of Microcontroller 8051 and apply the knowledge of Architecture and Instruction Set		3												
			2	CO2	Understand the working of Internal Peripherals of 8051 and Apply Interfacing concepts of few I/O Peripherals to 8051 through programming.		3												
			3	CO3	Understand the functional model of Microprocessor 8086 (term)		3												
			4	CO4	Understand the working model of ARM Processor		3												
			5	CO5	Applying the knowledge of 8051 and working on peripherals		3												
26	13-EC312	Design with PLDs and FPGAs	1	CO1	Understand the basics of Full custom, Semicustom and PLD design methodologies		3												
			2	CO2	Design various combinational & sequential logic realizations using PLEs & PLDs.		3												
			3	CO3	Analyze the architectures of different FPGAs.		3												
			4	CO4	Design various sequential logic realizations using new generation PLDs.		3												
			5	CO5	Analyze the digital modules through project oriented approach		3												

27	13-EC313	Antenna and Wave Propagation	1	CO1	To Understand basic radiating process and their parameters.	3												3
			2	CO2	Have an understanding & analysis of the characteristics of different wire & array antennas &comparison b/w different antenna technologies & processes.		3											
			3	CO3	Analyze the wave propagation mechanisms at various levels of free space, deciding a suitable antenna for such a scenario				3									
			4	CO4	Be able to complete a significant antenna design project and characterization of performance measures.					3								
28	13-EC415	DSP Processors and Architecture	1	CO1	To establish the theory necessary to understand and use of Adaptiveness in system control and related constructions.	2												
			2	CO2	To establish the theory necessary to understand the Wiener filter, search methods and the LMS algorithm					2								
			3	CO3	To emphasize on efficient algorithms for adaptive systems.													2
			4	CO4	To emphasize on Vector space framework for optimal filtering					2								
29	13-EC314	Microwave Engineering	1	CO1	Understand the essential features & principles of microwave devices and mathematical models which are relevant to microwave systems and limitations of devices					3								

			2	CO2	Understand various types of High gain and wide band Microwave tubes												3
			3	CO3	Understand the microwave passive devices, Tee junctions and various ferrite devices				3								
			4	CO4	Understand the operation of solid state devices(Various Diodes operate at high frequency)												3
			5	CO5	Understand the measurement of various parameters (VSWR, Power, Radiation pattern of antenna and Impedance measurement etc.)				3								
30	13-EC340	Information Theory & Coding	1	CO1	Describe the basic terminology of information theory and coding				2								
			2	CO2	Demonstrate the encoding of the source output												2
			3	CO3	Illustrate the importance of error control in coding												2
			4	CO4	Distinguish different binary cyclic codes and convolution codes				2								
31	13-EC342	Optical Communications	1	CO1	Understand the basics of light signals and different types of optical communication link methodologies				2								
			2	CO2	Understand the concepts of transmission characteristics of optical fibers and dispersion				2								

			3	CO3	Analyze the concepts of optical transmission and detectors, electro optic modulation and optical amplifier					2								
			4	CO4	Analyze the concept of basic networks					2								
32	13-EC443	Satellite Communications	1	CO1	Understand the fundamentals of satellite communications and characteristics of communication satellites.	1												
			2	CO2	Evaluate and design general satellite orbital terms and elements.					1								
			3	CO3	Design satellite subsystems which comprise space, earth segments and link budget parameters.					1								
			4	CO4	Understand the basic concepts of multiple access techniques, satellite navigation and GPS.	1												
33	13-EC444	Cellular Communications	1	CO1	Understand cellular concept, frequency reuse and hand off strategies					2								
			2	CO2	Evaluate and design wireless and cellular communication systems over a stochastic fading channel.					2								
			3	CO3	Evaluate Equalizers and diversity techniques in mobile receiver design					2								
			4	CO	Analyze latest wireless technologies such as MIMO and OFDM systems.					2								

				4														
34	13-EC345	EMI/EMC	1	CO1	Understanding of the EMI and EMC Concept.	2												2
			2	CO2	Analyze and design EMI Control technique such as shielding ,grounding, bonding,transeient supressors		2											
			3	CO3	Design of EMC Design guidlines				2									
			4	CO4	Understanding of Passive Components for EMC,testing setups					2								
35	13-EC346	RF System Design	1	CO1	Differentiate different RF components and transmission lines					2								
			2	CO2	Demonstrate the smith chart applications, multiport networks					2								
			3	CO3	Design different RF-Filters based on stability and gain					2								
			4	CO4	Develop different types of RF amplifiers					2								
36	13-EC447	Radar & Navigational Aids	1	CO1	Compare different types of radars and their limitations		2			2								
			2	CO	Illustrate the operation of MTI Radar and types of tracking methods					2								

				2														
			3	CO3	Differentiate different radar transmitters and receivers		2											
			4	CO4	Compare different types of electronic counter measures					2								
37	13-EC448	Microwave and Millimetric Wave Circuits	1	CO1	Differentiate different Microwave components													
			2	CO2	Identify transformers and microwave resonators													
			3	CO3	Design different microwave filters													
			4	CO4	Distinguish microwave and millimetric wave circuits													
38	13-EC349	Radiating Systems	1	CO1	Demonstrate the radiation mechanism and antenna parameters		2											
			2	CO2	Distinguish different types of radiation from apertures		2											
			3	CO3	Select the antennas and arrays based on the specific application		2											

			4	CO4	Evaluate the antenna performance with measurement techniques		2											
39	13-EC461	Analog VLSI Design	1	CO1	Understand the functionality and Electrical Properties of MOS and BJT Devices		2											
			2	CO2	Analyze different passive MOS loads and frequency responses					2								
			3	CO3	Analyze different active MOS loads and frequency responses					2								
			4	CO4	Study of the different amplifiers and feedback topologies		2											
40	13-EC362	Low Power VLSI Design	1	CO1	Understand the sources of Power dissipation and approaches to minimize the power dissipation	2												
			2	CO2	Analyze the functionality of Analog and Digital power analysis		2											
			3	CO3	Study of the low power system, clock distribution					2								
			4	CO4	Study of the different Algorithms & Architectural Level Methodologies													2
41	13-EC36	ASIC Design	1	CO1	Understand the basics of VLSI design rules and different types of ASIC design methodologies	2												

	3		2	CO2	Design and Program of different logic circuits using Verilog and test it by some of the tests available					2						
			3	CO3	Partition,Place and route the ASIC for different aspects and extract the final circuit					2						
42	13-EC364	Design for Testability	1	CO1	Understand the basic concept reliability and modeling of faults as a requisite for achieving manufacturing quality of semiconductor devices and then identifies difficulties in VLSI testing		3									
			2	CO2	Analyze the fault tolerant system can be viewed as a design moving through different abstraction levels, a historical view of the development of VLSI system					3						
			3	CO3	Study of the test pattern generation for BIST architectures					3						
			4	CO4	Study of the specific BIST architectures		3									
43	13-EC371	Modern Digital Signal Processing	1	CO1	Acquire the fundamental concepts of decimation and interpolation for multirate signal processing	3										
			2	CO2	Estimation of power spectrum using parametric and non-parametric method. Matlab implementation to demonstrate relative merits and demerits					3						
			3	CO3	DFT filter banks and transmultiplexers analysis. Domonstration and implementation for two channel perfect reconstruction in time and frequency domain.											3

			4	CO4	Applications of DFT filter banks in Sampling rate converter, Phase shifter, Subband coding and Sensor systems					3							
44	13-EC372	Digital Image Processing	1	CO1	Acquire the fundamental concepts of a digital image processing system	2											
			2	CO2	Identify and exploit analogies b/w the mathematical tools used for 1Dand 2D signal analysis and analyzing 2D signals in the frequency domain through the FT.					2							
			3	CO3	Design and implement with Matlab algorithms for digital image processing operations such as histogram equalization, enhancement, and restoration, filtering, and denoising which develops an appreciation for the image processing issues and techniques and be able to apply these techniques to real world problems.	2											
45	13-EC373	Multirate Signal Processing	1	CO1	Demonstrate various multirate operations and associated filter bank models.	2											
			2	CO2	Analyze maximally decimated filter bank structures and their poly phase representation.					2							
			3	CO3	Understand para-unitary systems and linear phase perfect reconstruction filter banks					2							
			4	CO4	Analyze cosine modulated filter banks and their poly phase structures												2

46	13-EC474	Speech Processing	1	CO1	To establish the theory necessary to understand and use speech based systems and related constructions.					2										
			2	CO2	To emphasize on efficient algorithms for speech based systems.					2										
			3	CO3	To study applications in speech signal processing, speech based systems. The course has computer and research projects involving independent study.					2										
			4	CO4	To study applications in speech sensing software in mobile.					2										
47	11EM330	Real Time Operating Systems	1	CO1	Able to analyze embedded systems, analyze and program on chip peripherals for a single purpose controller					2										
			2	CO2	Able to interface and program different off chip peripherals and communication protocols used in embedded systems					2										
			3	CO3	Able to understand, evaluate and select appropriate software architectures					2										
			4	CO4	Able to analyze and design embedded systems using the features in real time operating systems.					2										
			5	CO5	Able to develop a prototype for a real time embedded application using project based labs.					2										
48	13E	PCB Design	1	CO	Understand the active and passive components, characteristics					2										

	M332			1													
			2	CO2	and the materials used along with their properties,					2							
			3	CO3	mounting components on PCB , classification of PCB boards					2							
			4	CO4	Understand different copperclad laminates and their properties, Soldering techniques.					2							
49	11EM334	Micro Controllers Interfacing & System Design	1	CO1	Understand transducers and 8086 processor					2							
			2	CO2	Understand signal processing and memory interfacing					2							
			3	CO3	Understand the basics of interfacing of various peripherals to PC					2							
			4	CO4	Understand bus interfacing &Apply interfacing to the PC with keyboard, printer, motor using serial data communications					2							
50	11EM430	Advanced Embedded Processor Architecture	1	CO1	Able to understand and analyze the 3 and 5 stage pipelines of ARM and able to program the ARM processor.								2				
			2	CO2	Able to program the on chip & off chip peripherals of ARM 7 controller.												2

			3	CO3	Understand and analyze the AMBA bus architecture and different advanced ARM cores.								2			
			4	CO4	Able to analyze the different SOC applications using ARM cores.											2
51	11EM432	Hardware Software Co Design	1	CO1	Understand and Analyze the co-design models like FSM, DFG and target architectures and use the tools required for designing the hardware and software models									1		
			2	CO2	Analyze Validation and Verification Techniques, design specification for embedded processor architectures											1
			3	CO3	Analyze the compilation techniques and tools for embedded processor architectures									1		
			4	CO4	Understand the standard design methods like COSYMA system and LYCOS systems.											1
52	13-EM336	Embedded Networking	1	CO1	Able to understand and develop applications using Rs-232C, RS-485 and SPI communication protocols.									2		
			2	CO2	Able to understand and develop applications using I2C, USB coomunication protocols.											2
			3	CO3	Able to understand and develop applications using CAN communication protocols									2		

			4	CO4	Able to understand and analyze different wireless communication protocols used in Embedded Systems.																2

Professor incharge Head of the department

K L UNIVERSITY

DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE ENGINEERING

2013

UNIVERSITY

Vision

To be a globally renowned university.

Mission

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

DEPARTMENT

VISION

To promote innovation centric education and perform cutting edge research in interdisciplinary and multidisciplinary areas**.**

MISSION

To impart **value-based, state-of-art education** and motivate the students to become **socially committed professionals** for **overall development** of students

M1: Impart Value –Based Education

M2: Impart State of the art –education

M3: Motivate Students to become Socially Committed Professionals

M4: Overall Development of Students

PROGRAM EDUCATIONAL OBJECTIVES (PEOS) :

PEO1: Practice engineering in a broad range of industrial, societal and real world applications.

PEO2: Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.

PEO3: Conduct themselves in a responsible, professional, and ethical manner.

PEO4: Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.

STUDENT OUTCOMES(SOs)

(a) an ability to apply knowledge of mathematics, science, and engineering

(b) an ability to design and conduct experiments, as well as to analyze and interpret data

(c) an ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

(d) an ability to function on multidisciplinary teams

(e) an ability to identify, formulate, and solve engineering problems

(f) an understanding of professional and ethical responsibility

(g) an ability to communicate effectively

(h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context

(i) a recognition of the need for, and an ability to engage in life-long learning

(j) a knowledge of contemporary issues

(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

PEOS VS MISSION MAPPING

	M1	M2	M3	M4
PEO1	√	√		√
PEO2		√		√
PEO3			√	√
PEO4			√	√

STUDENT OUTCOMES (SOS) VS PEOS MAPPING

SO'S	PEO1	PEO2	PEO3	PEO4
a	√	√		
b	√	√		
c	√	√		
d		√		√

e	**√**	**√**		
f			**√**	**√**
g		**√**	**√**	**√**
h		**√**	**√**	**√**
i	**√**	**√**	**√**	
j	**√**	**√**	**√**	**√**
k	**√**	**√**	**√**	

COURSE VS SOS MAPPING

Course Code	Course Title	CO NO	Description of the Course Outcome	a	b	c	d	e	f	g	h	i	j	k
13-EM-430	ADVANCED EMBEDDED PROCESSOR	CO 1	Understand 3 and 5 stage pipelines of ARM and able to program the ARM processor.	1										
		CO 2	Applying instructions set of ARM 7 processor using assembly language											2
		CO 3	Understanding the AMBA bus architecture	1										
		CO 4	Analyze different advanced ARM cores and their use in SoC applications											2
13EC 206	CMOS VLSI Design	CO 1	Understand semiconductor device fabrication process and Electrical Properties.					2						
		CO 2	Analyze the characteristics of CMOS circuits Construction and the comparison between different state-of-the-art CMOS technologies and processes					2						
		CO 3	Design schematic diagrams , stick diagrams and layouts for digital circuits using CMOS and n-MOS logic											3
		CO 4	Analyze CMOS circuits in terms of area, speed and power dissipation by applying the techniques like transistor sizing & design rules.											2
		CO	Design and develop Digital CMOS circuits using Microwind											3

		5														
13EM 201	**Computer Organization**	CO 1	Understand the logical gates to construct combinational & sequential circuits to perform different µ-operations and design of basic computer					1								
		CO 2	Develop micro Programs for design of Control Unit, CPU					1								
		CO 3	Apply and realize operations like Multiplication, Floating Point algorithms using supporting modern engineering tools.													2
		CO 4	Understand Memory Hierarchy, mapping procedures and the Peripherals, I/O interface and Direct Memory Access.					1								
		CO 5	Design and Simulation of System Design using Logisim Tool													2
13-EM-E32	**Embedded Networking**	CO 1	Understanding the concepts of Embedded Networking Communication Standard protocols: RS 232, RS 485, SPI, I2C bus protocols.										1			
		CO 2	Analyze the US B& CAN based synchronization Techniques										1			
		CO 3	Applying Ethernet communication protocols for Embedded Systems										1			
		CO 4	Apply different wireless sensor networks used in embedded systems.													2
11 EM 401	**EMBEDDED SYSTEMS**	CO 1	Analyze embedded systems,													
		CO 2	Analyze and program on chip peripherals and off chip peripherals for a single purpose controller					2								
		CO 3	Analyze the basic interfacing and communication protocols used in embedded systems.													2
		CO 4	Analyze and select appropriate software architecture and analyze the features real time operating systems.					2								

		CO 5	Develop and demonstrate a small embedded system for a real time application.					2								
13 EM 431	**ENTERPRISE PROGRAMMING**	CO 1	Create and Deploy web application											3	3	
		CO 2	Understand and Apply JSF and JDBC											2	2	
		CO 3	Apply EJB technologies to Real Life applications											2	2	
		CO 4	Understand middleware technologies											1	1	
13 EM 433	**SEMANTIC WEB**	CO 1	Understand the basics of knowledge representation using ontologies & architecture of semantic web											1		
		CO 2	Understand the fundamentals of various ontology markup languages											1		
		CO 3	Understand the need for ontology management and tools.												2	
		CO 4	Understand the applications of semantic web specifically web services through a case study											1		
11OE 432	**DATA WAREHOUSING AND MINING**	CO 1	Understand types of database, need for data mining and data warehouse Architecture.											1		
		CO 2	Understand the data Pre-processing techniques, and apply association rule mining on transactional data											1, 2		
		CO 3	Apply classification & prediction techniques on various data sets												2	
		CO 4	Apply clustering techniques on large data sets											2		
13 AC 301	ADVANCED EMPLOYABILITY SKILLS	CO 1	Understand and adopt appropriate behavior patterns													
		CO 2	Understand ,remember and apply lexical, syntactic skills related to grammar, usage and composition													

		CO 3	Analyze and apply various interpersonal skills in day-to-day communication												
		CO 4	Understand, learn and apply .the principles of various types of GDs and Personal Interviews												
13 EC 312	**Design with PLDs and FPGAs**	CO 1	Understand the basics of Full custom, Semicustom and PLD design methodologies		1										
		CO 2	Study and analysis of various combinational & sequential logic realizations using PLEs & PLDs		2										
		CO 3	Compare and analysis of architectures of different FPGAs		2										
		CO 4	Memorize and analysis of various sequential logic realizations using new generation PLDs		2										
		CO 5	Create and Analysis of digital modules through project oriented approach												3
11EC 311	**MICROPROCESSOR & MICROCONTROLLER**	CO 1	Understand the working of Microcontroller 8051 and Instruction Set		1										
		CO 2	Apply Interfacing concepts of few I/O Peripherals to 8051 through programming.		2										
		CO 3	Apply the Programming concepts of 8086		2										
		CO 4	Understand the working model of ARM Processor		1										
		CO 5	Applying the knowledge of 8051 and working through peripherals												3
13 EM 332	**PCB DESIGN.**	CO 1	Understand the active and passive components, characteristics and the materials used along with their properties, mounting components on PCB , classification of PCB boards					1							
		CO 2	Understand different copper clad laminates and their properties, Soldering techniques.					1							
		CO 3	Apply the knowledge of schematic and layout to design a PCB					2							

		CO 4	Understand the basics of PCB Fabrication and generate foot print for library, etc					1								
11EM 330	**Real Time Operating Systems**	CO 1	Understand the basic principles of operating systems structures, design and implementation of processes and introduction to distributed operating systems.					1								
		CO 2	Understand task state, process synchronization and analyze various synchronization and deadlock problems					1								
		CO 3	Apply different real time models, languages and scheduling.					2								
		CO 4	Apply RTOS in various application domains.													2
13-CS-301	**SOFTWARE ENGINEERING**	CO 1	Understand traditional and modern software process models used in the development of software systems.											1		
		CO 2	Understand the traditional and modern trends in system modeling											1		
		CO 3	Design the architecture and UI for an application using the principles and concepts of software design and golden rules of UI.													3
		CO 4	Understand various software Quality concepts and testing strategies for development of quality software.													1
		CO 5	Apply various types of UML Diagrams for given case study using rational rose.													3
13EM 333	**VISUAL PROGRAMMING**	CO 1	Understand the building blocks of .NET framework					1								
		CO 2	Understand C# Language Fundamentals					1								
		CO 3	Apply Object Oriented Programming Concepts through C#											2		
		CO 4	Apply Interfaces, and collections through C# and understand .NET assemblies											2		

13EM 331	**WEB PROGRAM MING**	CO 1	Create static web pages using basic HTML and CSS.												3
		CO 2	Apply the fundamental components of the JavaScript programming language to a interactive web page.												2
		CO 3	Understand the concepts of Document Object Model and Event handling mechanisms in JavaScript.											1	
		CO 4	Create dynamic web pages using PHP and MYSQL.												3
11OE 432	**DATA WAREHOUS ING AND MINING**	CO 1	Understand types of database, need for data mining and data warehouse Architecture.											1	
		CO 2	Understand the data Pre-processing techniques, and apply association rule mining on transactional data											1 , 2	
		CO 3	Apply classification & prediction techniques on various data sets												2
		CO 4	Apply clustering techniques on large data sets											2	
13EC 205	**Analog Electronic Circuits**	CO 1	Designdifferent types of feed-back amplifiers and provide general solution for real time problems					3							
		CO 2	Design different types of Oscillators and provide general solution for real time problems, and Design active filters using OPAMPs					3							
		CO 3	Design other non-linear applications of OPAMPs such as precision rectifier, zero crossing detector, etc…, Design the applications of 555timer					3							
		CO 4	Analyze different types of Power amplifiers					2							

13 EC 203	**Basics of Digital Systems**	CO 1	Understand the representation of data using different codes and the principles of Boolean algebra to manipulate and minimize logic expressions	1											
		CO 2	Examine the functioning of different combinational logic circuits built with logic gates and the design procedure for developing circuits like adders, decoders, code converters, etc.					2							
		CO 3	Analyze the behavior of flip-flops and the operation of sequential circuits using flip-flops					2							
		CO 4	Implement the design approach for creating sequential circuits like counters, shift registers, etc., and the concept of ASM charts in describing the digital systems					2							
		CO 5	Implement different combinational and sequential circuits with NI MyDaq and Labview												3
13 CS 205	**Computer Networks**	CO 1	Understand OSI and TCP/IP Models and basics of physical layer and their issues	1											
		CO 2	Demonstrate Data Link layer issues and medium access control sub layers concepts					2							
		CO 3	Analyze and implement the algorithms of network, transport layers and concerned services	2				2							
		CO 4	Implement the concepts of TCP ,UDP and the application layer conceptions					2							
		CO 5	Demonstrate the basic concepts of protocols and their design including client/server models, connection oriented and connection-less models	3				3							
13CS 204	**Data Base Management**	CO 1	Understand advantages of DBMS and its characteristics, concepts & ER model.	1											

	System	CO 2	Demonstrate Relational Database using SQL detailing the role of Relational Algebra and Relational Calculus.		2										
		CO 3	Examine storing data, File organizations, Indexing and Illustrates Normal Forms.	2											
		CO 4	Interpret Transaction Management and Concurrency control techniques.	2											
		CO 5	Create database for a given case study.		2										
13ES 204	**DATA STRUCTURES**	CO 1	Student will be able to apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.	2			2								
		CO 2	Student will be able to analyze and compare linear data structures and analyze different searching and hashing techniques.	2			2								
		CO 3	Student will be able toanalyze and compare various non – linear data structures like Trees and Graphs.	2			2								
		CO 4	Student will be able to analyze and compare varioussorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.	2			2								
		CO 5	Studentwill be able to understand and execute lab experiments and develop a project along with his/her team members.		2										
13-BS 206	**Discrete Mathematics**	CO 1	Apply various Set Operations and Logical Inferences for solving problems and the principle of Mathematical Induction.	2				2							
		CO 2	Analyze Combinatorial and Permute Analysis, Binomial theorem, Multinomial theorem and Principle of Inclusion and Exclusion.					2							
		CO 3	Analyzedifferent types of Graphs,Lattices, Sorting and Searchingtechniques and Applications of Graphs	2											

		CO 4	Applyprocedure for solving Spanning Trees and different methods for solving Recurrence Relations.					2							
13AC 201	**Energy and Society**	CO 1	Understand the various forms of available energy and energy related aspects.								1		1		
		CO 2	Apply energy auditing methodology to estimate energy conservation of different case studies.								2		2		
		CO 3	Understand the environmental and geological impacts on the energy vice versa.								1		1		
		CO 4	Apply the planning and controlling aspects for economical energy usage.								2		2		
13ES 203	**Network Theory**	CO 1	Understand the VI characteristics of electrical elements, solution of complex problems of DC circuits using transformations, nodal, mesh analysis and theorems.	1											1
		CO 2	Understand the fundamentals and interconnection relations of 3 – phase circuits.	1											1
		CO 3	Analyze the series and parallel resonance and magnetic circuits.	2											2
		CO 4	Analyze the transient analysis of DC / AC circuits, two port networks and solve complex networks using topology.	2											2
		CO 5	Develop a circuit model for a given practical case, apply the basic tools of circuit analysis for getting desired response and refine the circuit model if necessary based on obtained response.	3	3										3
13EM 202	**Communication Systems**	CO 1	Understand the basics of Modulation and demodulation techniques, Different types of filtering techniques and Radio Receiver characteristics												1
		CO 2	Understand the sampling techniques and signal to noise ratio of different pulse modulation schemes		2										2

		CO 3	Design and understand the Digital Modulation schemes, bandwidth estimation and clock recovery					2							2
		CO 4	Understanding the source coding techniques and estimate the error detection and correction of different block codes.												2
11EM 301	**Internet Programming**	CO 1	Students demonstrate an understanding of basic HTML tags related to text, hyperlinks, Images and ordered/unordered lists.						1						1
		CO 2	Students will be able to Apply inline, internal, external CSS to define look and feel (style) of single/multiple web pages.												2
		CO 3	Students will be able to Apply basic Object Oriented programming concepts like Encapsulation, Inheritance and polymorphism to solve various computing problems.	2				2							
		CO 4	Students demonstrate an understanding of Servlets/JSP concepts to process data from HTML forms.					3							3
13EC 201	**Design of Electronic Systems**	CO 1	Design Basic Electronics Systems and circuits	1											2
		CO 2	Design Basic amplifiers	1	2			2							
		CO 3	Design linear amplifiers using op-amps	1	2			2							
		CO 4	Design basic applications of diode, BJT and JFET	2	1			2							
13ES 205	**Signal Processing**	CO 1	Understand the representation, manipulation and processing operations of DT signals and systems	1	1		1								
		CO 2	Interpret the analysis of DT systems using Z.T.				2	2							2
		CO 3	Apply the Fourier Transformation techniques for DT sequences and their applications		2		2	2							

		CO 4	Ability to design, Implementation and realization of digital filters.				2	2							2
13ES 202	**Object Oriented Programming**	CO 1	The student will be able to understand basic Concepts of OOP, fundamentals of java and apply the concepts of classes and objects through Java Language.					2							
		CO 2	The student will be able to apply constructors, Overloading, parameter passing, access control in Java programming.	2				2							
		CO 3	The student will be able to apply Inheritance, Packages, Interfaces.	2				2							
		CO 4	The student will be able to apply Exception Handling, I/O Streams and understand Basic Concepts of MultiThreading	2				2							
		CO 5	Students will be able to develop programs and projects in java.	2				2							
11EM 334	**Micro controllers Interfacing & System Design**	CO 1	Understand and remember the fundamentals of the microcontrollers like architecture, memory organization.					1							
		CO 2	Apply the instructions in writing basic assembly language programming.					2							
		CO 3	Apply the concepts of interrupts, timers in applications where required.					2							
		CO 4	Analyze the differences in architectures of 8051 and PIC µc's and Analyze Different I/O devices and their interfacing to 8051 µc												2
13HS 101	ENGLISH	CO 1	Kinesics: To enable the students with the study of body language as it is an essential component of soft skills.	1											
		CO 2	Lexis: Vocabulary building	1											
		CO 3	English usage and mechanics: Grammar and verbal reasoning					2							
		CO 4	Office communication to improve learning skills					2							
13HS 102	LANGUAGE AND REASONING SKILLS	CO 1	Understand the method of identifying the meaning of words and apply them in contexts.							2					
		CO 2	Understand and analyze different cultures and the importance of empathy in cross-cultural communication.						2						

		CO 3	Understand and analyze seven techniques of reading and improve reading speed.							2						
		CO 4	Understand and apply writing strategies in office/ formal communication							2						
11BS 105	ECOLOGY AND ENVIRONMENT	CO 1	Understand the importance of Environmental education and conservation of natural resources								1					
		CO 2	Understand the importance of ecosystems and biodiversity.									1				
		CO 3	Understand the knowledge on solid waste management										1			
		CO 4	Understand the knowledge on disaster management and EIA process										1			
13HS 104	HUMAN VALUES	CO 1	realize and understand the basic aspiration, harmony in the human being.						1				1			
		CO 2	envisage the roadmap to fulfill the basic aspiration of human beings.	2				2								
		CO 3	Aanalyze the profession and his role in this existence.						2				2			
		CO 4	Develops holistic perception by understanding harmony in nature						2				2			
13BS 101	LINEAR ALGEBRA AND MULTIVARIATE CALCULUS	CO 1	Perform elementary operations on matrices including determination of rank and inverse, demonstrate mastery in using matrix algebra to find the solution to a linear system equations, iterative methods: Jacobi's method and Gauss - Seidal method .Determine the eigen values and eigen vectors, Cayley-Hamilton theorem and its applications, nature of the quadratic forms	2	2			2								
		CO 2	Interpret and apply differential calculus on problems involving rate of change. Explain the geometrical interpretation and applications of Rolle's theorem and mean value theorems.Analyze the maximization and minimization problems.	2	1			2								
		CO 3	Illustrate the applications of integral calculus in solving problems on area, volume, displacement, work, etc. Computing improper integrals, Beta, Gamma functions and their properties. Compute multiple integrals by changing the order of integration and change of variables such as polar, spherical and cylindrical coordinates.	2	2			2								
		CO 4	Determine gradient, divergence and curl of vector point functions with their properties. Calculate the line, surface and volume integrals, Green's, Gauss divergence and Stoke's theorems and their applications.	2	2			2								
13BS 102	DIFFERENTIAL	CO 1	Describe different situations required to model differential equations. Classify the differential equations and identify suitable solution techniques	2	2											

	EQUATIONS	CO 2	Illustrate modeling an engineering problem as a first order ordinary differential equation (ODE) and solving it using numerical methods available viz. Taylor, Euler, modified Euler and Runge-Kutta method	2	1										
		CO 3	Analyze engineering problem solutions in particular electric circuits, deflection of beams, free oscillations, forced oscillations and resonance through differential equations	2	2										
		CO 3	Illustrate to model an engineering problem second order PDEs namely one dimensional wave and heat equations, two dimensional Laplace equation into PDEs and find their general solutions using C.F and P.I.	2	2										
13BS 103	ENGINEERING PHYSICS	CO 1	Explain how ultrasonic waves are produced and detected,	1											
			Determine flaws present inside a material using NDT techniques.												
		CO 2	Compute the magnetic induction produced by current carrying conductors by using Biot-Savart law & Ampere's law, Compute the Lorentz force experienced by a charged particle.	1											
		CO 3	Understand different aberrations in lenses and their corrections, phenomenon of interference in thin films of uniform thickness	1											
		CO 4	Explain the working of optoelectronic devices like LED, photodiode, photo transistor and solar cells, Explain the phenomenon of superconductivity and its applications	1											
11BS 104	ENGINEERING CHEMISTRY	CO 1	Examine water quality and select appropriate purification technique for intended problem		2	2									
		CO 2	Predict potential complications from combining various chemicals or metals in an engineering setting		2	2									
		CO 3	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena		2	2									
		CO 4	Apply phase rule, polymers, conducting polymers and nano chemistry to engineering processes			2									
		CO 5	An ability to analyze & generate experimental skills		2	2									
13BS 201	MATHEMATICAL METHODS	CO 1	Identify different mathematical problems and reformulate them to facilitate numerical treatment using an appropriate technique.	2											
		CO 2	Apply Fourier series, Fourier transforms and Z-transforms to analyze various signals.	2											
		CO 3	Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance and to estimate unknown parameters of populations and apply the tests of hypotheses.	2											
13ES 103	ENGINEERING	CO 1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.	1											

	MATERIALS	CO 2	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.	1											
		CO 3	Understands role of molecular vibrations in determining thermal properties of materials and deformation of materials in response to action of load, for identification of materials having specific engineering applications.	1											
		CO 4	Understands spin and orbital motion of electrons in determining magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.	1											
13ES 102	MEASURMENTS	CO 1	Understand and apply the fundamentals of a measurement system, characteristics, transducers and metrology using simulation and experimentation tools.	2	2										
		CO 2	Understand various electrical & computer parameters, and apply different measuring techniques on various electrical parameters using simulation and experimentation tools.	2	2										
		CO 3	Understand electronic & electro-physiological parameters, and apply measuring techniques on electronic parameters using simulation and experimentation tools.	2	2										
		CO 4	Understand and apply different measuring techniques on civil and mechanical parameters using simulation and experimentation tools.	2	2										
11ES 104	ENGINEERING GRAPHICS WITH CAD	CO 1	Draft Orthographic views, projections of planes and , solidsmanually and by using CAD software Tool (AutoCAD)					2							
		CO 2	Drafting Sectional views , Isometric views manually and by using AutoCAD					2							
		CO 3	Development of surfaces and perspectives views manually and by using AutoCAD					2							
13ES 105	WORKSHOP PRACTICE	CO 1	Project based workshop to prepare different models with the aid of workshop trades i.e., Carpentry and Tin smithy												2
		CO 2	Project based workshop to prepare different models with the aid of workshop trades i.e.,House wiring and Fitting												2
		CO 3	Project based workshop to prepare different models with the aid of workshop trades i.e.,Fitting												2
13ES 101	PROBLEM SOLVING THROUGH PROGRAMMING	CO 1	Illustrate how problems are solved using computers and programming.	2				2							
		CO 2	Interpret & Illustrate user defined C functions and different operations on list of data.	2				2							
		CO 3	Implement Linear Data Structures and compare them.		2										
		CO 4	Implement Binary Trees.		2										

13ES 106	ENGINEERING MECHANICS	CO 1	Understand the concept of forces and apply the static equilibrium equations.	1				2							
		CO 2	Analyze co-planar and non co-planar system of forces.	2				2							
		CO 3	Apply the concept of centroid & centre of gravity to determine moment of inertia.	2				2							
		CO 4	Analyze the rigid bodies under translation and rotation with and without considering forces.	2				2							
13ES 201	THERMODYNAMICS	CO 1	Apply first law of thermodynamics to non flow systems	2				2							
		CO 2	Apply steady flow energy equation and second law of thermodynamics to various processes and engineering devices	2				2							
		CO 3	apply principle of entropy and thermodynamic relations to thermodynamic system and process	2				2							
		CO 4	Evaluate the performance of Otto, Diesel, Dual cycles and Refrigeration cycles	2				2							
13BS 103	ENGINEERING PHYSICS	CO 1	Explain how ultrasonic waves are produced and detected, Determine flaws present inside a material using NDT techniques.	1											
		CO2	Compute the magnetic induction produced by current carrying conductors by using Biot-Savart law & Ampere's law, Compute the Lorentz force experienced by a charged particle.	1											
		CO3	Understand different aberrations in lenses and their corrections, phenomenon of interference in thin films of uniform thickness	1											
		CO4	Explain the working of optoelectronic devices like LED, photodiode, photo transistor and solar cells, Explain the phenomenon of superconductivity and its applications	1											

K L UNIVERSITY
DEPARTMENT OF MECHANICAL ENGINEERING
PROGRAM DEVELOPMENT DOCUMENT
B.Tech in Electrical and Electronics Engineering
2013

Vision of the University

To be a globally renowned university.

Mission of the university:

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

VISION of the Department

To Produce globally renowned leader in education, extension activities and Carrying out research and technology development in frontier areas of electronics and electrical engineering and allied fields

MISSION of the Department

To produce quality electrical and electronics engineers having strong theoretical foundation, innovative, good design experience , exposure to research and development and responsible for social needs.

Program Educational Objectives

1. Apply their immense knowledge acquired in Electrical and Electronics Engineering with modern computational tools to serve the needs of ongoing research and industry

2. Apply their immense knowledge acquired in Electrical and Electronics Engineering with modern computational tools to pursue Higher Education.
3. Employ Leadership Qualities with professional and ethical values in effectively dealing with Societal Challenges.
4. Inculcate in students, Self and Lifelong Learning, effective interpersonal communication skills when working with multidisciplinary teams

ProgramOutcome's

a. Ability to apply knowledge of mathematics, science, and engineering
b. Ability to design and conduct experiments, as well as to analyze and interpret data
c. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability
d. Ability to function on multidisciplinary teams
e. Ability to identify, formulate, and solve engineering problems
f. Understanding of professional and ethical responsibility
g. Ability to communicate effectively
h. Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
i. Recognition of the need for, and an ability to engage in life-long learning
j. Knowledge of contemporary issues
k. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

MAPPING OF PEOs with MISSION OF THE DEPARTMENT:

S.No.	Program Educational Objectives(PEOs)	M1	M2	M3	M4
1	Apply their immense knowledge acquired in Electrical and Electronics Engineering with modern computational tools to serve the needs of ongoing research and industry.		√	√	√
2	Apply their immense knowledge acquired in Electrical and Electronics Engineering with modern computational tools to pursue Higher Education.		√	√	√
3	Employ Leadership Qualities with professional and ethical values in effectively dealing with Societal Challenges.	√	√	√	
4	Inculcate in students, Self and Lifelong Learning, effective interpersonal communication skills when working with multidisciplinary teams.	√	√	√	

MAPPING OF POs/PSOs with PEOs:

Mapping of POs to PEOs					
S.No.	Program Objectives(POs)	Program Educational Objectives(PEOs)			
		1	2	3	4
a	An ability to apply knowledge of mathematics, science, and engineering	√	√		
b	An ability to design and conduct experiments, as well as to analyze and interpret data	√	√		
c	An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability	√	√	√	

d	An ability to function on multidisciplinary teams				**√**
e	An ability to identify, formulate, and solve engineering problems	**√**	**√**		
f	An understanding of professional and ethical responsibility			**√**	
g	An ability to communicate effectively				**√**
h	The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context	**√**	**√**	**√**	
i	A recognition of the need for, and an ability to engage in life-long learning				**√**
j	A knowledge of contemporary issues	**√**	**√**		
k	An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.	**√**	**√**		
l	Project management and finance			**√**	

K L UNIVERSITY

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

2013 Course Outcomes

Course Articulation Matrix

Course Code	Course Title	S NO	CO NO	Description of the Course Outcome	a	b	c	d	e	f	g	h	i
13HS101	ENGLISH	11	CO1	Kinesics: To enable the students with the study of body language as it is an essential component of soft skills.	1								
			CO2	Lexis: Vocabulary building	1								
			CO3	English usage and mechanics: Grammar and verbal reasoning					2				
			CO4	Office communication to improve learning skills					2				
11BS105	ECOLOGY AND ENVIRONMENT	6	CO1	Understand the importance of Environmental education and conservation of natural resources								1	
			CO2	Understand the importance of ecosystems and biodiversity.									1
			CO3	Understand the knowledge on solid waste management									
			CO4	Understand the knowledge on disaster management and EIA process									
13BS101	LINEAR ALGEBRA AND MULTIVARIATE CALCULUS	8	CO1	Perform elementary operations on matrices including determination of rank and inverse, demonstrate mastery in using matrix algebra to find the solution to a linear system equations, iterative methods: Jacobi's method and Gauss - Seidal method .Determine the eigen values and eigen vectors, Cayley-Hamilton theorem and its applications, nature of the quadratic forms	2	2			2				
			CO2	Interpret and apply differential calculus on problems involving rate of change. Explain the geometrical interpretation and applications of Rolle's theorem and mean value theorems.Analyze the maximization and minimization problems.	2	1			2				

			CO3	Illustrate the applications of integral calculus in solving problems on area, volume, displacement, work, etc. Computing improper integrals, Beta, Gamma functions and their properties. Compute multiple integrals by changing the order of integration and change of variables such as polar, spherical and cylindrical coordinates.	2	2			2					
			CO4	Determine gradient, divergence and curl of vector point functions with their properties. Calculate the line, surface and volume integrals, Green's, Gauss divergence and Stoke's theorems and their applications.	2	2			2					
13BS103	ENGINEERING PHYSICS	3	CO1	Explain how ultrasonic waves are produced and detected, Determine flaws present inside a material using NDT techniques.	1									
			CO2	Compute the magnetic induction produced by current carrying conductors by using Biot-Savart law & Ampere's law, Compute the Lorentz force experienced by a charged particle.	1									
			CO3	Understand different aberrations in lenses and their corrections, phenomenon of interference in thin films of uniform thickness	1									
			CO4	Explain the working of optoelectronic devices like LED, photodiode, photo transistor and solar cells, Explain the phenomenon of superconductivity and its applications	1									
13ES103	ENGINEERING MATERIALS	12	CO1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.	1									
			CO2	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.	1									
			CO3	Understands role of molecular vibrations in determining thermal properties of materials and deformation of materials in response to action of load, for identification of materials having specific engineering applications.	1									
			CO4	Understands spin and orbital motion of electrons in determining magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.	1									
11ES104	ENGINEERING GRAPHICS WITH CAD	14	CO1	Draft Orthographic views, projections of planes and , solidsmanually and by using CAD software Tool (AutoCAD)					2					
			CO2	Drafting Sectional views , Isometric views manually and by using AutoCAD					2					
			CO3	Development of surfaces and perspectives views manually and by using AutoCAD					2					
13ES101	PROBLEM SOLVING THROUGH C - PROGRAMMING	9	CO1	Illustrate how problems are solved using computers and programming.	2				2					
			CO2	Interpret & Illustrate user defined C functions and different operations on list of data.	2				2					

			CO3	Implement Linear Data Structures and compare them.		2								
			CO4	Implement Binary Trees.		2								
13HS102	LANGUAGE AND REASONING SKILLS	4	CO1	Understand the method of identifying the meaning of words and apply them in contexts.							2			
			CO2	Understand and analyze different cultures and the importance of empathy in cross-cultural communication.						2				
			CO3	Understand and analyze seven techniques of reading and improve reading speed.							2			
			CO4	Understand and apply writing strategies in office/ formal communication							2			
13HS104	HUMAN VALUES	13	CO1	realize and understand the basic aspiration, harmony in the human being.						1				
			CO2	envisage the roadmap to fulfill the basic aspiration of human beings.										
			CO3	Aanalyze the profession and his role in this existence.						2				
			CO4	Develops holistic perception by understanding harmony in nature						2				
13BS102	DIFFERENTIAL EQUATIONS	5	CO1	Describe different situations required to model differential equations. Classify the differential equations and identify suitable solution techniques	2	2								
			CO2	Illustrate modeling an engineering problem as a first order ordinary differential equation (ODE) and solving it using numerical methods available viz. Taylor, Euler, modified Euler and Runge-Kutta method	2	1								
			CO3	Analyze engineering problem solutions in particular electric circuits, deflection of beams, free oscillations, forced oscillations and resonance through differential equations	2	2								
			CO3	Illustrate to model an engineering problem second order PDEs namely one dimensional wave and heat equations, two dimensional Laplace equation into PDEs and find their general solutions using C.F and P.I.	2	2								
11BS104	ENGINEERING CHEMISTRY	1	CO1	Examine water quality and select appropriate purification technique for intended problem		2	2							
			CO2	Predict potential complications from combining various chemicals or metals in an engineering setting		2	2							
			CO3	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena		2	2							
			CO4	Apply phase rule, polymers, conducting polymers and nano chemistry to engineering processes			2							
13ES102	MEASURMENTS	10	CO1	Understand and apply the fundamentals of a measurement system, characteristics, transducers and metrology using simulation and experimentation tools.	2	2								

			CO2	Understand various electrical & computer parameters, and apply different measuring techniques on various electrical parameters using simulation and experimentation tools.	2	2								
			CO3	Understand electronic & electro-physiological parameters, and apply measuring techniques on electronic parameters using simulation and experimentation tools.	2	2								
			CO4	Understand and apply different measuring techniques on civil and mechanical parameters using simulation and experimentation tools.	2	2								
13ES105	WORKSHOP PRACTICE	7	CO1	Project based workshop to prepare different models with the aid of workshop trades i.e., Carpentry and Tin smithy										
			CO2	Project based workshop to prepare different models with the aid of workshop trades i.e.,House wiring and Fitting										
			CO3	Project based workshop to prepare different models with the aid of workshop trades i.e.,Fitting										
13ES106	ENGINEERING MECHANICS	2	CO1	Understand the concept of forces and apply the static equilibrium equations.	1				2					
			CO2	Analyze co-planar and non co-planar system of forces.	2				2					
			CO3	Apply the concept of centroid & centre of gravity to determine moment of inertia.					2					
			CO4	Analyze the rigid bodies under translation and rotation with and without considering forces.	2				2		2			
13ES201	THERMODYNAMICS	20	CO1	Apply first law of thermodynamics to non flow systems	2				2					
			CO2	Apply steady flow energy equation and second law of thermodynamics to various processes and engineering devices	2				2					
			CO3	apply principle of entropy and thermodynamic relations to thermodynamic system and process	2				2					
			CO4	Evaluate the performance of Otto, Diesel, Dual cycles and Refrigeration cycles	2				2					
11ES203	Network Theory	100	CO1	Understand the VI characteristics of electrical elements, solution of complex problems of DC circuits using transformations, nodal, mesh analysis and theorems.	1		□	□	1	□				
		101	CO2	Understand the fundamentals and interconnection relations of 3 – phase circuits.	1				1	□	□			
		102	CO3	Analyze the series and parallel resonance, magnetic circuits and transient analysis of DC / AC circuits.	2		□	□	2	□	□			
		103	CO4	Analyze the two port networks and solve complex networks using topology.	2		□	□	2	□	□			

13BS201	MATHEMATICAL METHODS	15	CO1	Identify different mathematical problems and reformulate them to facilitate numerical treatment using an appropriate technique.	2									
			CO2	Apply Fourier series, Fourier transforms and Z-transforms to analyze various signals.	2									
			CO3	Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance and to estimate unknown parameters of populations and apply the tests of hypotheses.	2									
13ES205	SIGNAL PROCESSING	25	CO1	Understand the representation, manipulation and processing operations of DT signals and systems					1					
			CO2	Interpret the analysis of DT systems using Z.T.					2					
			CO3	Apply the Fourier Transformation techniques for DT sequences and their applications.					2					
			CO4	Ability to design, Implementation and realization of digital filters.					2					
			CO5	Design and Implementation of the Signal processing algorithms in Matlab.										
13EC201	Design of Electronics Systems	100	CO1	Understand the fundamentals of Basic Electronic systems.	1		□	□	1	□				
		101	CO2	Remembering the equivalent models of different Basic Electronic Systems.	1				1	□	□			
		102	CO3	Analyzing different types of amplifiers using OP-AMP, BJTs and JFETs.	2		□	□		□	□			
		103	CO4	Applying fundamental structures of Basic Electronic systems to design different types of Amplifiers	2		□	□		□	□			
13-EE 201	DC Machines & Transformers	1	CO1	Apply the basic principles of electromechanical energy conversion to electrical machines					2					
		2	CO2	Analyze operating characteristics of various types of DC generators.					2					
		3	CO3	Identify various speed control methods of DC motor and evaluate this performance					2					
		4	CO4	Evaluate the performance of a transformers and selecting it for particular application.					2					
		5	CO5			2								
13ES202	OBJECT ORIENTED PROGRAMMING	23	CO1	Understand Basic Concepts of OOP and apply the concepts of classes and objects through Java Language.	2				2					
			CO2	Apply the concepts of constructors, Overloading, parameter passing, access control, Inheritance.	2				2					

			CO3	Apply Packages, Interfaces, Exception Handling.	2				2					
			CO4	Apply I/O Streams and understand Basic Concepts of Multi –Threading	2				2					
			CO5	Develop programs and projects in Java.	2				2					
13ES204	DATA STRUCTURES	24	CO1	Student will be able to apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.	2				2					
			CO2	Student will be able to analyze and compare linear data structures and analyze different searching and hashing techniques.	2				2					
			CO3	Student will be able to analyze and compare various non – linear data structures like Trees and Graphs.	2				2					
			CO4	Student will be able to analyze and compare various sorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.	2				2					
			CO5	Student will be able to understand and execute lab experiments and develop a project along with his/her team members.		2								
13BS202	Complex Variables and Discrete Mathematics	100	CO1	Construct the analytic function and evaluate the contour integrals also represent analytic function as a series.	2		□	□		□				
		101	CO2	Evaluate the integrals involving Bessel and Legendre polynomials and Model the given phenomena as difference equation and solve it.	2					□	□			
		102	CO3	Use graphs and trees as tools to visualize network problems	1		□	□		□	□			
		103	CO4	Apply algorithms and theorems for construction of spanning trees	2		□	□		□	□			
13-EE 202	Fields & Networks	6	CO1	Analyze electrostatic fields of different distributions using vector algebra	2	□	□	□		□				
		7	CO2	Analyze electrostatic fields of different distributions and Maxwell's equation for Time varying fields	2				□	□	□			
		8	CO3	Synthesize the single port network (R-L,R-C & L-C) using Foster & Cauer forms	2	□	□	□		□	□			
		9	CO4	Analyze Low pass & High pass M-derived and k-derived filters	2	□	□	□		□	□			
		10	CO5	Test the Electrical Network elements properties by designing filters	3	□	□		□	□				
13-EE 203	AC MACHINES	11	CO1	Evaluate the performance of 3-phase induction motor.	□	2								
		12	CO2	Analyze different speed control and starting methods of 3-phase induction machine.	□	2								
		13	CO3	Evaluate the performance of 3-phase alternator.	□	2								
		14	CO4	Illustrate the performance of 3-phase synchronous motor and 1-phase induction motor.	□	2								

		15	CO5	Test the performance of AC Machines.		2								
15EC2103	ANALOG ELECTRONIC CIRCUIT DESIGN	25	CO1	Design different types of feed-back amplifiers and provide general solution for real time problems					3					
			CO2	Design different types of Oscillators and provide general solution for real time problems, and Design active filters using OPAMPs					3					
			CO3	Design other non-linear applications of OPAMPs such as precision rectifier, zero crossing detector, etc…, Design the applications of 555timer					3					
			CO4	Analyze different types of Power amplifiers					2					
			CO5	Getting a Hands-on of various devices and circuits studied during the course (Lab and LTC) in all the COs										
11-EE 203	Electrical Power Generation and Distribution	16	CO1	Understand various generating stations.			1							
		17	CO2	Understand the concepts of transmission line parameters, Corona, Mechanical Sag and Insulators			2							
		18	CO3	Analyze the performance of overhead transmission lines and underground cables.										
		19	CO4	Analyze substation layouts and their design considerations			2							
		20	CO5	Test and apply knowledge obtained from Generation, transmission & distribution using any software tool or hardware										
11-EE 304	Control Systems	21	CO1	Understand the mathematical representation of various systems in the contextof control engineering					1					
		22	CO2	Analysis of control systems in time domain & determination of stability					2					
		23	CO3	Analysis of control systems in frequency domain & determination of Stability					2					
		24	CO4	Modelling and analysis of control systems in state space domain										
11-EE 303	Power Electronics	25	CO1	Select appropriate switch for a given power converter			1							
		26	CO2	Evaluate the steady state performance of Basic DC-DC converters			3							
		27	CO3	Evaluate the performance of Basic Switch-Mode PWM Inverter			3							
		28	CO4	Understand and analyze the operation of Basic Phase controlled converters										

		29	CO5	Test and evaluate basic power electronic converters by using Matlab software or hardware.											
	Power System Analysis	30	CO1	Apply the knowledge of Graph theory for modeling of power system network	2				2						
		31	CO2	Apply mathematical methods for the solution of Load flow problem	2				2						
		32	CO3	Analysis of Symmetrical faults and application of symmetrical components	2				2						
		33	CO4	Analysis of power system with Unsymmetrical faults	2				2						
11-EE 302		34	CO5	Analysis of Power system problems using simulation tools	2				2						
	Electric Drives	35	CO1	Understand the characteristics of various electric drives suitable for particular loads	1										
		36	CO2	Apply different ac-dc converters for speed control of DC Motor drives			2								
		37	CO3	Differentiate between stator side control and rotor side control of 3-phase Induction Motor drives		2									
		38	CO4	Analyze frequency control of Synchronous Motor drives for variable speed operation			2								
11EE307		39	CO5	Identify suitable speed control method to control the speed of a particular electric drive experimentally		2									
	Power System Operation & Control	40	CO1	Understand selecting the best generators to have Economic Dispatch		1									
		41	CO2	Analyze the performance of Load Frequency Control					2						
		42	CO3	Analyze the performance of Automatic Voltage Regulator					2						
		43	CO4	Analyze rotor angle stability.								2			
11-EE 402		44	CO5	Numerical methods to solve operation of power systems					2						
	Power System Protection	45	CO1	To apply per unit system and to draw the reactance diagrams					*						
		46	CO2	To analyze the short circuit faults in a power system					*						
		47	CO3	To Evaluate the performance of different protective relays & Circuit breakers					*						
		48	CO4	To understand the concepts of lightning arresters and the neutral grounding					*						
11-EE 305		49	CO5	Test and Analyze various power system protection concepts using MATLAB					*						
	Microprocessors & Microcontrollers	45	CO1	Understand the working of Microcontroller 8051 and Instruction Set		1									
11-EC 311		46	CO2	Apply Interfacing concepts of few I/O Peripherals to 8051 through programming.		2									

		47	CO3	Understand the working model of ARM Processor		1									
		48	CO4	Apply the Programming concepts of 8086		2									
		49	CO5	Apply the Knowledge of 8051 and working through peripherals											
11-EE 334	Operation of Restructured Power Systems	54	CO1	Students are able to analyze the concept of regulation, deregulation, market structure, market architecture, and power system old vs new.					1						
		55	CO2	Students can be able to understand Electricity sector structures, Different structure models, Bilateral & Pool markets and LMP based markets.					1						
		56	CO3	Students can be able to analyze Power wheeling transactions and marginal costing, transmission costing, Congestion management methods- market splitting, counter-trading; Effect of congestion on LMPs.					2						
		57	CO4	Students can be able to understand Ancillary Services and System Security in Deregulation.					1						
11-EE 338	Distribution System Planning & Automation	58	CO1	Understand the load forecasting, various tariffs and meters.	1				1						
		59	CO2	Understand the optimal locations of substation, types of distribution feeders.	1				1						
		60	CO3	Understand various protection schemes and their coordination.	1				1						
		61	CO4	Analyze various earthing schemes and SCADA application.	1				1						
11-EE 431	Power Quality	62	CO1	Understand the Power Quality problems in power system and analyze the characteristics of Long interruptions					1						
		63	CO2	Analyze the characteristics of short interruptions.					2						
		64	CO3	Analyze the characteristics of voltage sag.					1						
		65	CO4	Understand and apply mitigation methods to interruptions and voltage sag problems.					3						
11-EE 435	HVDC & FACTS	66	CO1	Evaluating various HVDC transmission systems converter circuits and its control scheme	2										
		67	CO2	Analyzing FACTS devices for improving system stability		2									
		68	CO3	Analyzing the knowledge for improving stability and understanding the concepts of harmonics and designing of filters		2									
11-EE 331	MACHINE MODELING AND ANALYSIS	69	CO1	Understand the representation of every machine in two axis machine and knowing concept of reference frame theory	1				1						
		70	CO2	Analyze torque equation for different DC motor during steady and transient state condition	2				2						

		71	CO3	Analyze to obtain mathematical modeling of Induction motor	2				2					
		72	CO4	Analyze mathematical modeling of Synchronous motor.	2				2					
11-EE 335	ADVANCED POWER ELECTRONICS	73	CO1	Understand various advanced inverter topologies and Analyze various PWM techniques to control them					1					
		74	CO2	Analyze the performance of various DC-DC converters		2			2					
		75	CO3	Understand the working of various resonant converter topologies		1								
11-EE 339	Switched Mode Power Supplies	76	CO1	Design of non isolated DC-DC converters			3							
		77	CO2	Design the operation of isolated DC-DC converters		3								
		78	CO3	Analyze the operation of Resonant converters					2					
		79	CO4	Develop mathematical for closed loop control techniques of DC-DC converters	3									
11-EE 431	POWER QUALITY	80	CO1	Understand various power quality issues.					1					
		81	CO2	Analyze various power quality issues and its causes.					2					
		82	CO3	Analyze the different mitigating techniques for voltage sag and swells.					1					
		83	CO4	Design and analyze voltage sag and swell using simulation tools.					3					
11-EE 332	State Estimation & System Identification	84	CO1	Understanding the importance of probability theory in estimating system parameters					1					
		85	CO2	Understanding the importance of stochastic process in estimating system models					1					
		86	CO3	Analysis of the optimal prediction and smoothing for discrete linear systems					2					
		87	CO4	Analysis of the optimal estimation for continuous linear systems					2					
11-EE 336	Digital Control Systems	88	CO1	Understand Z-transform and its properties.	1				1					
		89	CO2	Analyze systems in frequency domain using Z transform.	2				2					
		90	CO3	Design the basic compensators for discrete time systems using Root locus and Bilinear transformation	3				3					
		91	CO4	Design the state controllers for discrete-data control systems using state variable approach.	3				3					

	Nonlinear Control Systems	92	CO1	Understand the importance linear and nonlinear systems and describing function for various nonlinear elements.	1				1					
		93	CO2	Analyze the nonlinear systems through phase trajectories .	2				2					
		94	CO3	Analyze the stability of nonlinear system using lyapunov stability criterion.	2				2					
11EE340		95	CO4	Understand the importance of fuzzy controller technique for a non-linear system	1				1					
	OPTIMAL CONTROL SYSTEMS	96	CO1	Describe first order optimality condition for optimal control problem.	1				1					
		97	CO2	Describe first order optimality condition for calculus of variations for a optimal control problem	1				1					
		98	CO3	Understand the importance of optimal control for linear time invariant systems by solving the corresponding Riccati equations	1				1					
11 EE 432		99	CO4	Understand and estimate the operation of optimal control techniques	1				1					
	Adaptive Control Systems	100	CO1	Understand the importance of Adaptive control systems	1				1					
		101	CO2	Analyze the different techniques for the Identification of linear time-invariant systems.	2				2					
		102	CO3	Analyze the suitability of a particular adaptive control system	2				2					
11-EE 436		103	CO4	Differentiate the different approximation techniques of the system.	1				1					
	Solar Energy	104	CO1	Understanding the system geometry of solar radiation, data, solar to thermal conversion and its application	1				1					
		105	CO2	Analyzing the process of photovoltaic effect and PV cell characteristics	2				2					
		106	CO3	Analyzing the power electronic components involved and various MPPT algorithms	2				2					
11-EE 333		107	CO4	Analyzing the performance of Autonomous and Grid Linked PV systems	2				2					
	Wind Energy	108	CO1	Understand about the basic concepts of wind energy conversion system and different types of wind turbines	1								1	
		109	CO2	Understand the different types of control systems of wind turbine and fixed speed generating systems	1	1								
		110	CO3	Analyze the variable speed generating systems and modeling parameters of wind turbine rotor		2							2	
11-EE 337		111	CO4	Apply basic knowledge for classifying wind energy conversion configurations	2	2								
	Nuclear Energy	112	CO1	Understand the basic concepts in Nuclear Energy and Power Systems	1				1					
11-EE 341		113	CO2	Analyze the construction and operation of Nuclear Reactors	2				2					

		114	CO3	Analyze the construction and operation Nuclear detectors and accelerators	2				2					
		115	CO4	Analyze the concepts of process instrumentation and control	2				2					
11-EE 437	Energy Conservation & Audit	116	CO1	Understand the energy auditing methods to meet the energy conservation and various tariffs	1							1		
		117	CO2	Apply the energy conservation techniques to power system elements	2							2		
		118	CO3	Apply the energy conservation opportunities in air conditioning, refrigeration and air compressor systems	2							2		
		119	CO4	Evaluate the energy conservation opportunities in heating systems and also in cogeneration Plants	2							2		
11-EE 205	Electrical Power Transmission	100	CO1	Determine the electrical parameters of Transmission line for different types of transmission systems with case study	1				1					
		101	CO2	Evaluate the performance of Transmission system with mathematical models with case study	2				2					
		102	CO3	Analyze the mechanical design of Transmission System	2				2					
		103	CO4	Apply the concept of Per Unit System to solve complex problems in electrical power transmission Systems	2				2					
13ES203	Basics of Digital Systems	24	CO1	Understand the representation of data using different codes and the principles of Boolean algebra to manipulate and minimize logic expressions					1					
			CO2	Examine the functioning of different combinational logic circuits built with logic gates and the design procedure for developing circuits like adders, decoders, code converters, etc.					2					
			CO3	Analyze the behavior of flip-flops and the operation of sequential circuits using flip-flops					2					
			CO4	Implement the design approach for creating sequential circuits like counters, shift registers, etc., and the concept of ASM charts in describing the digital systems					2					
			CO5	Implement different combinational and sequential circuits with NI MyDaq and Labview										
13TP401	Term Paper								3					
13PW401	Major Project								3					

COURSE-PO MAPPING

MAPPING OF COURSES WITH STUDENT OUTCOMES (2013 Regulations)

S NO	Course Code	Course Title	Course Catgory	L-T-P	Credits	Pre-Requisite	Student Outcome										
							a	b	c	d	e	f	g	h	i	j	k
1	13-HS 101	English	Humanities & Social Sciences	2-0-2	3	Nil*							2		1		
2	13BS102	Differential Equations	Basic Sciences	3-1-0	4	Nil	2	2									
3	13-HS 102	Language and Reasoning Skills	Humanities & Social Sciences	2-0-2	3	Nil*							2		1		
4	11-BS 105	Ecology & Environment	Humanities & Social Sciences	2-0-0	2	Nil*						1				1	
5	13-HS 104	Human Values	Humanities & Social Sciences	2-0-0	2	Nil*								1		1	
6	13-BS 103	Engineering Physics	Basic Sciences	3-0-2	4	Nil*	2	1									
7	11-BS 104	Engineering Chemistry	Basic Sciences	3-0-2	4	Nil*	2	1									
8	13ES106	Engineering Mechanics	Engineering Sciences	3-0-2	4	Nil	2				2						
9	13ES105	Workshop Practice	Engineering Sciences	0-0-4	2	Nil											2
10	13-ES 103	Engineering Materials	Engineering Sciences	3-0-0	3	Nil*	1									1	
11	13ES101	Problem Solving Through C	Engineering Sciences	3-0-2	4	Nil	2				2						
12	13BS101	Linear Algebra and Multivariable Calculus	Basic Sciences	3-0-2	4	Nil	2	2			2						
13	13-ES 102	Measurements	Engineering Sciences	3-0-2	4	Nil*		2			1						

14	11-ES 104	Engineering Graphics with CAD	Engineering Sciences	0-0-4	2	Nil*		2									1
15	13BS201	Mathematical Methods	Basic Sciences	3-0-0	3	13BS101 13BS102	2										
16	13-ES 201	Thermodynamics	Engineering Sciences	3-0-0	3	13-BS 103	2				1						
17	13-EE 201	DC Machines and Transformers	Professional Core	3-0-2	4	13EE201		2			2						2
18	13-ES 202	Object Oriented Programming	Engineering Sciences	3-0-2	4	13-ES 101	2										1
19	13ES204	Data Structures	Engineering Sciences	3-0-2	4	13ES101	2				2						
20	13-ES 203	Network Theory	Engineering Sciences	3-0-2	4	13-BS 101	2										1
21	13-ES 205	Signal Processing	Professional Core	3-0-2	4	13-BS 102					2						2
22	13-EC 201	Design of Electronic Systems	Professional Core	3-0-2	4	13-BS 103			2								2
23	13 BS 202	COMPLEX VARIABLES AND DISCRETE MATHEMATICS	Basic Sciences	3-0-0	3	13BS101 13BS102	2										
24	13-EE 202	Fields & Networks	Professional Core	3-0-2	4	13EE202	3										3
25	11-EE 205	Electric Power Transmission	Professional Core	3-0-2	4	11EE205	2				2						
26	13-EE 203	AC Machines	Professional Core	3-0-2	4	13EE203		2									2
27	11-EE 303	Power Electronics	Professional Core	3-0-2	4	11EE303			2								2
28	13-EE 203	Electric Power Generatin and Distribution	Professional Core	3-0-2	4	11EE203			2								2
29	13-EC 203	Basics of Digital Systems	Professional Core	3-0-2	4	13-BS 101		2									1
30	11-EE 304	Control Systems	Professional Core	3-0-2	4	13-ES 203					2						1
31	13-EC 205	Analog Electronic Circuits	Professional Core	3-0-2	4	13-EC 201			2								3
32	11-EE 302	Power System Analysis	Professional Core	3-0-2	4	11EE302	2				2						
33	11-EE 307	Electric Drive	Professional Core	3-0-2	4	11EE307		2	2								
34	11-EC 311	Microprocessor and controllers	Professional Core	3-0-2	4	13-EC 201		2									2
35	13-EE 402	Power System Operation and Control	Professional Core	3-0-2	4	13-ES 205					2						2
36	11 EE 305	Power System Protection	Professional Core	3-0-2	4	13-EC 207					2						2
37	11-EE 338	Distribution System Planning & Automation	Professional Elective (Power Systems)	3-0-0	3	11-EE 205	1				1						
38	11-EE 334	Operation Restructured Power Systems		3-0-0	3	11-EE 205					2					1	

39	11-EE435	HVDC & FACTS		3-0-0	3	11-EE 303	2	2									
40	11-EE 431	Power Quality		3-0-0	3	11-EE 303					3						3
41	13-EE 330	Smart Grid Technologies		3-0-0	3	11-EE 203		1		1						2	
42	11-EE 335	Advanced Power Electronics	Professional Elective (Power Electronics)	3-0-0	3	11-EE 303		2			2						
43	11-EE 331	Machne Modelling Analysis		3-0-0	3	13-EE 203	2				2						
44	11-EE 435	HVDC & FACTS		3-0-0	3	11-EE 303	2	2									
45	11-EE 431	Power Quality		3-0-0	3	11-EE 303					2						3
46	11 -EE 339	Switched Mode Power Supplies		3-0-0	3	11-EE 303	3		3		3					2	
47	11-EE 332	State Estimation & System Identification	Professional Elective (Control Systems)	3-0-0	3	11-EE 304					2						
48	11-EE 336	Digital Control Systems		3-0-0	3	11-EE 304	3				3						
49	11-EE 340	Non Linear Control Systems		3-0-0	3	11-EE 304	2				2						
50	11-EE 432	Optimal Control Systems		3-0-0	3	11-EE 304	1				1						
51	11-EE 436	Adaptive Control Systems		3-0-0	3	11-EE 304	2				2						
52	11-EE 437	Energy Conservation & Audit	Professional Elective (Energy Szstems)	3-0-0	3	13-AC 201	2							2			
53	11-EE 333	Solar Energy		3-0-0	3	13-AC 201	2				2						
54	11-EE 337	Wind Energy		3-0-0	3	13-AC 201	2	2							2		
55	11-EE 341	Nuclear Energy		3-0-0	3	13-Ac 201	2				2						
56	11-EE 433	Nano Materials for Energy and Environment		3-0-0	3	13-ES 103	2							2			
57	13-EE 501	Computer Architecture	Professional Elective (Digital Systems)	3-0-0	3	13-EC 203			2								1
58	13-EE 502	PLD's & FPGAs		3-0-0	3	13-EC 203			2								2
59	13-EE 503	VLSI Design		3-0-0	3	13-EC 203			2		2						
60	13-EE 504	Embedded System Design		3-0-0	3	13-EC 203			2						2		
61	13-EE 505	DSP Processors		3-0-0	3	13-EC 203		2									2
63		PARADIGMS IN MANAGEMENT THOUGHT	Management Elective	3-0-0	3	NIL									1	1	
64	11-HS-203	INDIAN ECONOMY		3-0-0	3	NIL	1	1									
65	11-HS-208	MANAGING PERSONAL FINANCE		3-0-0	3	NIL	1	2	3								

66	11 HS 209	BASICS OF MARKETING FOR ENGINEERS		3-0-0	3	NIL		3										
67	11HS211	ORGANIZATION MANAGEMENT		3-0-0	3	NIL	1		1									
68	11 -OE414	DISASTER MANAGEMENT	Open Elective	3-0-0	3	NIL	1		2									
69	11OE309	REMOTE SENSING AND GIS		3-0-0	3	NIL	2											
70	11OE408	IPR & PATENT LAWS		3-0-0	3	NIL	2											
71	11OE426	RENEWABLE ENERGY RESOURCES		3-0-0	3	NIL	2								2			
72	11OE433	E-COMMERCE		3-0-0	3	NIL										2	2	
73	13OE429	FUNDAMENTALS OF INFORMATION TECHNOLOGY		3-0-0	3	NIL	2				2							
74	13OE421	LINUX PROGRAMMING		3-0-0	3	NIL					2						2	
75	11 OE 431	RADAR SYSTEMS		3-0-0	3	NIL					2							
76	11-OE-422	OPTICAL ENGINEERING		3-0-0	3	NIL	1				2							
77	11-OE-424	MOBILE COMMUNICATIONS		3-0-0	3	NIL	2				2							
78	11OE432	DATA WAREHOUSING AND MINING		3-0-0	3	NIL										2	2	
79	12OE445	FUNDAMENTALS OF DATABASE MANAGEMENT SYSTEMS		3-0-0	3	NIL	1	2										
80	13-OE475	MEASURMENTS AND INSTRUMENTATION		3-0-0	3	NIL					1							
81	13 OE 432	ANIMATION FOR ENGINEERS		3-0-0	3	NIL	1								2			
82	13OE433	PHOTOGRAPHY		3-0-0	3	NIL					2							
83	12OE442	MECHATRONICS		3-0-0	3	NIL			2		2							
84	12OE443	ROBOTICS		3-0-0	3	NIL	3		2									
85	13TP401	Term Paper		0-0-4	2					3					3			
87	13PW401	Major Project		0-0-24	12					3					3			
Totals							43	21	15	3	36	1	2	3	9	9	25	

K L UNIVERSITY
DEPARTMENT OF MECHANICAL ENGINEERING
PROGRAM DEVELOPMENT DOCUMENT
B.Tech in Mechanical Engineering
2013

Vision of University:

To be a globally renowned university.

Mission of University:

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

Vision of Department:

To be a globally renowned leader in education, research and extension activities in emerging areas of mechanical engineering and allied fields.

Mission of Department:

Training the leaders, innovators and outstanding career professionals of tomorrow and conducting fundamental research to address major technological roadblocks.

Program Educational Objectives

1. Practice Engineering in a broad range of industrial, societal and real world applications.
2. Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.
3. Conduct themselves in a responsible, professional, and ethical manner.
4. Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.

Program Outcome's

l. Ability to apply knowledge of mathematics, science, and engineering

m. Ability to design and conduct experiments, as well as to analyze and interpret data

n. Ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability

o. Ability to function on multidisciplinary teams

p. Ability to identify, formulate, and solve engineering problems

q. Understanding of professional and ethical responsibility
r. Ability to communicate effectively
s. Broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
t. Recognition of the need for, and an ability to engage in life-long learning
u. Knowledge of contemporary issues
v. Ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

MAPPING OF PEOs with MISSION OF THE DEPARTMENT:

S.No	Description of PEOs	Key Components of Mission			
		M 1	**M 2**	**M 3**	**M 4**
		Training the leaders of tomorrow	Training the innovators of tomorrow	Training the outstanding career professionals of tomorrow	Conducting fundamental research
PEO 1	Practice Engineering in a broad range of industrial, societal and real world applications	.	. ✓	. ✓	
PEO 2	Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers		✓		✓
PEO 3	Conduct themselves in a responsible, professional, and ethical manner	✓			

PEO 4	Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world	✓		✓	✓

MAPPING OF POs/PSOs with PEOs:

	Key Components of POs and PSOs	**Description of PEO**			
		Practice Engineering in a broad range of industrial, societal and real world applications	Pursue advanced education, research and development, and other creative and innovative efforts in science, engineering, and technology, as well as other professional careers.	Conduct themselves in a responsible, professional, and ethical manner.	Participate as leaders in their fields of expertise and in activities that support service and economic development throughout the world.
		PEO 1	**PEO 2**	**PEO 3**	**PEO 4**
a	Engineering knowledge	✓	✓		✓
b	Conduct investigations of complex problems	✓	✓		✓
c	Design/ development of	✓	✓		✓
d	Individual and team work	✓	✓	✓	✓

e	Problem analysis	✓	✓		✓
f	Ethics	✓	✓	✓	✓
g	Communication	✓	✓	✓	✓
h	The engineer and society	✓	✓	✓	✓
i	Modern tool usage	✓	✓		✓
j	Lifelong learning	✓	✓	✓	✓
k	Environment and sustainability	✓	✓	✓	✓

K L UNIVERSITY

DEPARTMENT OF MECHANICAL ENGINEERING

2013-2017 BATCH Course Outcomes

Course Articulation Matrix

Course Code	Course Title	Credits	CO NO	Description of the Course Outcome	a	b	c	d	e	f	g	h	i	j	k
11BS104	ENGINEERING CHEMISTRY	4	CO1	Examine water quality and select appropriate purification technique for intended problem		2	2								
			CO2	Predict potential complications from combining various chemicals or metals in an engineering setting		2	2								
			CO3	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena		2	2								
			CO4	Apply phase rule, polymers, conducting polymers and nano chemistry to engineering processes			2								
13ES106	ENGINEERING MECHANICS	4	CO1	Understand the concept of forces and apply the static equilibrium equations.	1				2						
			CO2	Analyze co-planar and non co-planar system of forces.	2				2						
			CO3	Apply the concept of centroid & centre of gravity to determine moment of inertia.	2				2						
			CO4	Analyze the rigid bodies under translation and rotation with and without considering forces.	2				2						
13BS103	ENGINEERING PHYSICS	4	CO1	Explain how ultrasonic waves are produced and detected, Determine flaws present inside a material using NDT techniques.	1										

			CO2	Compute the magnetic induction produced by current carrying conductors by using Biot-Savart law & Ampere's law, Compute the Lorentz force experienced by a charged particle.	1											
			CO3	Understand different aberrations in lenses and their corrections, phenomenon of interference in thin films of uniform thickness	1											
			CO4	Explain the working of optoelectronic devices like LED, photodiode, photo transistor and solar cells, Explain the phenomenon of superconductivity and its applications	1											
13HS102	LANGUAGE AND REASONING SKILLS	3	CO1	Understand the method of identifying the meaning of words and apply them in contexts.							2					
			CO2	Understand and analyze different cultures and the importance of empathy in cross-cultural communication.						2						
			CO3	Understand and analyze seven techniques of reading and improve reading speed.							2					
			CO4	Understand and apply writing strategies in office/ formal communication							2					
13BS102	DIFFERENTIAL EQUATIONS	4	CO1	Describe different situations required to model differential equations. Classify the differential equations and identify suitable solution techniques	2	2										
			CO2	Illustrate modeling an engineering problem as a first order ordinary differential equation (ODE) and solving it using numerical methods available viz. Taylor, Euler, modified Euler and Runge-Kutta method	2	1										

			CO3	Analyze engineering problem solutions in particular electric circuits, deflection of beams, free oscillations, forced oscillations and resonance through differential equations	2	2									
			CO3	Illustrate to model an engineering problem second order PDEs namely one dimensional wave and heat equations, two dimensional Laplace equation into PDEs and find their general solutions using C.F and P.I.	2	2									
11BS105	ECOLOGY AND ENVIRONMENT	2	CO1	Understand the importance of Environmental education and conservation of natural resources								1			
			CO2	Understand the importance of ecosystems and biodiversity.									1		
			CO3	Understand the knowledge on solid waste management										1	
			CO4	Understand the knowledge on disaster management and EIA process										1	
13ES105	WORKSHOP PRACTICE	2	CO1	Project based workshop to prepare different models with the aid of workshop trades i.e., Carpentry and Tin smithy											2
			CO2	Project based workshop to prepare different models with the aid of workshop trades i.e.,House wiring and Fitting											2
			CO3	Project based workshop to prepare different models with the aid of workshop trades i.e.,Fitting											2

13BS101	LINEAR ALGEBRA AND MULTIVARIATE CALCULUS	4	CO1	Perform elementary operations on matrices including determination of rank and inverse, demonstrate mastery in using matrix algebra to find the solution to a linear system equations, iterative methods: Jacobi's method and Gauss - Seidal method .Determine the eigen values and eigen vectors, Cayley-Hamilton theorem and its applications, nature of the quadratic forms	2	2			2						
			CO2	Interpret and apply differential calculus on problems involving rate of change. Explain the geometrical interpretation and applications of Rolle's theorem and mean value theorems.Analyze the maximization and minimization problems.	2	1			2						
			CO3	Illustrate the applications of integral calculus in solving problems on area, volume, displacement, work, etc. Computing improper integrals, Beta, Gamma functions and their properties. Compute multiple integrals by changing the order of integration and change of variables such as polar, spherical and cylindrical coordinates.	2	2			2						
			CO4	Determine gradient, divergence and curl of vector point functions with their properties. Calculate the line, surface and volume integrals, Green's, Gauss divergence and Stoke's theorems and their applications.	2	2			2						
13ES101	PROBLEM SOLVING THROUGH PROGRAMMING	4	CO1	Illustrate how problems are solved using computers and programming.	2				2						
			CO2	Interpret & Illustrate user defined C functions and different operations on list of data.	2				2						
			CO3	Implement Linear Data Structures and compare them.		2									

			CO4	Implement Binary Trees.		2										
13ES102	MEASURMENTS	4	CO1	Understand and apply the fundamentals of a measurement system, characteristics, transducers and metrology using simulation and experimentation tools.	2	2										
			CO2	Understand various electrical & computer parameters, and apply different measuring techniques on various electrical parameters using simulation and experimentation tools.	2	2										
			CO3	Understand electronic & electro-physiological parameters, and apply measuring techniques on electronic parameters using simulation and experimentation tools.	2	2										
			CO4	Understand and apply different measuring techniques on civil and mechanical parameters using simulation and experimentation tools.	2	2										
13HS101	ENGLISH	3	CO1	Kinesics: To enable the students with the study of body language as it is an essential component of soft skills.		1				2	3					
			CO2	Lexis: Vocabulary building		1				2	3					
			CO3	English usage and mechanics: Grammar and verbal reasoning		1				2	3					
			CO4	Office communication to improve learning skills		1				2	3					
13ES103	ENGINEERING MATERIALS	3	CO1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.	1											
			CO2	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.	1											
			CO3	Understands role of molecular vibrations in determining thermal properties of materials and deformation of materials in response to action of load, for identification of materials having specific engineering applications.	1											
			CO4	Understands spin and orbital motion of electrons in determining magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific	1											

				engineering applications.												
13HS104	HUMAN VALUES	2	CO1	realize and understand the basic aspiration, harmony in the human being.						1				1		
			CO2	envisage the roadmap to fulfill the basic aspiration of human beings.												
			CO3	Aanalyze the profession and his role in this existence.						2				2		
			CO4	Develops holistic perception by understanding harmony in nature						2				2		
11ES104	ENGINEERING GRAPHICS WITH CAD	2	CO1	Draft Orthographic views, projections of planes and , solidsmanually and by using CAD software Tool (AutoCAD)					2							
			CO2	Drafting Sectional views , Isometric views manually and by using AutoCAD					2							
			CO3	Development of surfaces and perspectives views manually and by using AutoCAD					2							
13BS201	MATHEMATICAL METHODS	3	CO1	Identify different mathematical problems and reformulate them to facilitate numerical treatment using an appropriate technique.	2											
			CO2	Apply Fourier series, Fourier transforms and Z-transforms to analyze various signals.	2											
			CO3	Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance and to estimate unknown parameters of populations and apply the tests of hypotheses.	2											
13ES203	NETWORK THEORY	4	CO1	Understand the VI characteristics of electrical elements, solution of complex problems of DC circuits using transformations, nodal, mesh analysis and theorems	1	1									1	

			CO2	Understand the fundamentals and interconnection relations of 3 – phase circuits	1										1
			CO3	Analyze the series and parallel resonance and magnetic circuits	2	2									2
			CO4	Analyze the transient analysis of DC / AC circuits, two port networks and solve complex networks using topology	2	2									2
13ME201	FLUID MECHANICS & HYDRAULIC MACHINES	4	CO1	Apply physical laws related to fluid static (Pascal's law and Hydrostatic law) in applications involving fluid flow.					2						
			CO2	Apply fluid governing equations related to Fluid kinematics and dynamics (Continuity, Euler's, and Bernoulli's equation) in various fluid flow applications.					2						
			CO3	Estimate different losses in pipe and use impulse momentum equation to analyze impact of jet on various vanes.					2						
			CO4	Demonstrate and analyze the appropriate use of water turbine and centrifugal pump in given application.					2						
			CO5	Demonstrate the use of flow and pressure measuring devices in fluid flow applications.		2									
13 ME204	MANUFACTURING PROCESSES	4	CO1	Understand the concepts of manufacturing processes and engineering materials.	1										
			CO2	Choose appropriate casting technique's and apply them for making the desired castings with specified size and shape.	1										
			CO3	Create the components of desired geometry by identifying appropriate forming processes.	1										
			CO4	Evaluate the welded components produced by inspection and testing methods.	1										
13 ME205	STRENGTH OF MATERIALS	4	CO1	Apply concepts of stress and strain to analyze members with axial load and torsion individually					2						

			CO2	Analyze the members subjected to combination of stresses; Examine the behavior of beams subjected to lateral loads by sketching shear force and bending moment diagrams					2						
			CO3	Analyze structural behavior of beams by determining normal and shear stresses and determining slopes and deflections					2						
			CO4	Analyze structural behavior of columns under load and thin pressure vessels					2						
			CO5	Identify various mechanical properties of materials by performing tests		2									
13ES201	THERMODYNAMICS	4	CO1	Apply first law of thermodynamics to non flow systems	2				2						
			CO2	Apply steady flow energy equation and second law of thermodynamics to various processes and engineering devices	2				2						
			CO3	apply principle of entropy and thermodynamic relations to thermodynamic system and process	2				2						
			CO4	Evaluate the performance of Otto, Diesel, Dual cycles and Refrigeration cycles	2				2						
13ME202	APPLIED THERMODYNAMICS	4	CO1	Understand the properties of Pure substances and analyze the Rankine cycle efficiency	2		2								
			CO2	Understand the working of Boilers and Analyze the performance of Steam turbines	2		2								
			CO3	Apply the principles of nozzle and analyze the performance of Condensers	2		2								
			CO4	Apply the principles of Refrigeration and Psychrometry to refrigeration and air conditioning units	2		2								
			CO5	Able to do design a power plant , air conditioning unit and a refrigeration plant			2								
13ME206	MECHANISMS AND MACHINE THEORY	4	CO1	Identify various possible 4 link mechanisms and their inversions and applicability	1										

			CO2	Analyze mechanisms kinematically using velocity and acceleration diagrams	2											
			CO3	Generate cam profiles and Analyze gears and gear trains kinematically	2											
			CO4	Perform balancing of rotating and reciprocating parts and identify gyroscopic effects on Ships & Automobiles					2							
			CO5	Design Kinematically and Simulate mechanisms by using ADAMS software and analyze the data		2										
13ES202	OBJECT ORIENTED PROGRAMMING	4	CO1	Understand Basic Concepts of OOP and apply the concepts of classes and objects through Java Language.	2			2								
			CO2	Apply the concepts of constructors, Overloading, parameter passing, access control, Inheritance.	2			2								
			CO3	Apply Packages, Interfaces, Exception Handling.	2			2								
			CO4	Apply I/O Streams and understand Basic Concepts of Multi – Threading	2			2								
			CO5	Develop programs and projects in Java.	2			2								
13ES204	DATA STRUCTURES	4	CO1	Student will be able to apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.	2				2							
			CO2	Student will be able to analyze and compare linear data structures and analyze different searching and hashing techniques.	2				2							
			CO3	Student will be able to analyze and compare various non – linear data structures like Trees and Graphs.	2				2							
			CO4	Student will be able to analyze and compare various sorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.	2				2							

			CO5	Student will be able to understand and execute lab experiments and develop a project along with his/her team members.		2										
13ES205	SIGNAL PROCESSING	4	CO1	Understand the representation, manipulation and processing operations of DT signals and systems				1	1							
			CO2	Interpret the analysis of DT systems using Z.T.				2	2							
			CO3	Apply the Fourier Transformation techniques for DT sequences and their applications.				2	2							
			CO4	Ability to design, Implementation and realization of digital filters.				2	2							
			CO5	Design and Implementation of the Signal processing algorithms in Matlab.												3
13 BS 202	COMPLEX VARIABLES AND DISCRETE MATHEMATICS	3	CO1	Construct the analytic function and evaluate the contour integrals also represent analytic function as a series.	2											
			CO2	Evaluate the integrals involving Bessel and Legendre polynomials and Model the given phenomena as difference equation and solve it.	2											
			CO3	Use graphs and trees as tools to visualize network problems	1											
			CO4	Apply algorithms and theorems for construction of spanning trees	2											
14ME221	MACHINE DRAWING	Nil	CO1	Draw various machine elements and parts							2					2
			CO2	To Draw Assembly drawing from the given part drawings; To draw Part Drawings from the given assembly drawing							2					2
13AC201	ENERGY AND SOCIETY	Nil	CO1	Understand the various forms of available energy and energy related aspects.								1		1		
			CO2	Apply energy auditing methodology to estimate energy conservation of different case studies.								2		2		

			CO3	Understand the environmental and geological impacts on the energy vice versa.								1		1	
			CO4	Apply the planning and controlling aspects for economical energy usage.								2		2	
13ME203	METALLURGY	4	CO1	Identify and differentiate various types of materials, apply concepts of Miller indices and understand various material testing methods.	2										
			CO2	Analyze the concept of cooling curves, equilibrium phase diagrams, and heat treatment techniques.	2										
			CO3	Identify the importance of composites, ceramics and strengthening mechanisms.	1										
			CO4	Identify various nano, smart, bio-materials and powder metallurgy process and their applications.	1										
			CO5	Identification of metals and their alloys from microstructure study.		2									
13ME301	INTERNAL COMBUSTION ENGINES AND GAS TURBINES	4	CO1	To analyze various operating variables that effects I.C engines.					2						
			CO2	To analyze the normal combustion and abnormal combustion in I.C engines					2						
			CO3	Analyze the performance parameters of I.C engines, and able to solve the problems.					2						
			CO4	Analyze various methods for improving efficiencies of gas turbines, Evaluate the efficiencies of Gas Turbines and Jet engines.					2						
			CO5	To design and conduct experiments as well as to analyze and interpret data		2									

13ME302	MACHINE TOOL ENGINEERING	4	CO1	Explain about phenomenon of metal cutting, chip formation, types of chips and chip breakers, tool materials and measurement of tool forces and problems.			2									
			CO2	Identify and describe the functions of the parts of lathe, shaper, planar and slotting machines, explain operations performed on these machines and also tool and work holding devices.			1									
			CO3	Describe the components of drilling, boring, milling and grinding machines and also explain operations performed on these machines and tool and work holding devices.			1									
			CO4	Identify and describe elements of Jigs and Fixtures and also explain types of locators and clamps used. Students can also understand basic functions of NC, CNC and DNC and part programs.			1									
			CO5	Demonstrate various operations performed on lathe, mill, shaper, slotter, and drill and grinding machines and also know how to use different tool and work piece holders												2
13ME303	OPERATIONS RESEARCH	4	CO1	Identify Optimum solutions for various single objective problems using Linear Programming models					2							
			CO2	Identify Optimum Solutions through Transportation and Assignment models					2							
			CO3	Identify Optimum Solutions through Game theory, DPP, Queuing theory & Simulation models					2							
			CO4	Solve project management problems using CPM, PERT and Crashing					2							
			CO5	Solve Various Linear Programming, Transportation, Assignment, Game Theory and Simulation models through POM Software												2
13ME305	FINITE ELEMENT METHODS	4	CO1	Analyze and evaluate 3Dstresses & strains and the basic concepts of FEM	2											
			CO2	Analyze and evaluate 1D structural problems and plane trusses using FEM												2

			CO3	Analyze and evaluate 2D problems including axi-symmetric solids subjected to axi-symmetric loading using FEM												2
			CO4	Analyze and evaluate Scalar filed (thermal) problems and structural dynamic problems using FEM												2
			CO5	Apply the theoretical concepts to conduct various interpretation by using Analysis software's		2										
13AC301	ADVANCED EMPLOYABILITY SKILLS	Nil	CO1	Understand and adopt appropriate behavior patterns		1										
			CO2	Understand ,remember and apply lexical, syntactic skills related to grammar, usage and composition					2							
			CO3	Analyze and apply various interpersonal skills in day-to-day communication					2							
			CO4	Understand, learn and apply .the principles of various types of GDs and Personal Interviews					2							
13ME306	MECHANICAL ENGINEERING DESIGN	4	CO1	Analyze the stress and strain on mechanical components; and understand, identify and quantify failures resulting from static and dynamic loading					2							
			CO2	Design of Shafts and Couplings			3									
			CO3	Design of Power Screws temporary and permanent joints			3									
			CO4	Design of Springs and Flywheels			3									
			CO5	Analyze machine elements using ANSYS software												2
13ME304	METROLOGY AND INSTRUMENTATION	4	CO1	Understand the elements of measurement system, experimental test plan and to identify the importance of limits, fits, statistical measurement theory and sampling concepts	2											

			CO2	Apply gear measurements coordinate measuring machines, slip gauges, comparators, transducers, sine bar and angle gauges etc. in various engineering applications	2											
			CO3	Select profile projectors, autocollimators, stylus instruments and to understand temperature measurement devices for various applications	2											
			CO4	Analyze strain, pressure, force & torque measurements and to understand D/A & A/D conversion	2											
			CO5	Experimental Analysis with Measuring Equipment and Instrumentation Equipment's		2										
13ME401	HEAT TRANSFER	4	CO1	Apply Fourier law of conduction for one dimensional heat conduction in various systems					2							
			CO2	Analyze combined conduction and convective heat transfer under steady and unsteady state condition					2							
			CO3	Apply Newton's law of cooling and evaluate convective heat transfer coefficient for different fluids					2							
			CO4	Thermal design of two fluid heat exchangers. Understand and apply laws of radiation and evaluate radiate heat exchange between two bodies.					2							
			CO5	Experimental verification of various heat transfer parameters (Lab)		2										
13ME335	AUTOMIBILE ENGINEERING	3	CO1	Understand different types of chassis, engine components, fuel systems and its working principles	1				1							
			CO2	Understand different components of transmission system, cooling and lubrication systems	1				1							
			CO3	Understand different components of suspension, steering and braking systems	1				1							
			CO4	Understand different electric and electronic systems used in automobiles and pollution control techniques used in SI and CI engines.	1				1							

13ME365	FLEXIBLE MANUFACTURING SYSTEMS	3	CO1	Apply Group Technology concept to identify cells and machine sequencing with basic concepts of manufacturing and Automation					2						
			CO2	Apply Operational parameters and System performance measures to evaluate FMS Components					2						
			CO3	Schedule Jobs in FMS Environment by understanding FMS Host Computer and Tool Management System					2						
			CO4	Understand Implementation Issues, Applications of FMS and Robot Classification, Programming, applications											1
13ME356	MECHATRONICS SYSTEM AND CONTROL	3	CO1	Understanding the basic concepts of Modeling, Testing in terms of time domain and frequency domain			1								
			CO2	Analyze the basic designing concepts of Modern and optimal controllers such as state feedback and state observers.	2										
			CO3	Analyze the basic designing concepts of Digital controller for digital systems			2								
			CO4	Analyze the basic designing concepts of Non-linear controllers for non-linear systems			2								
13ME331	REFRIGERATION AND AIR CONDITIONING	3	CO1	Analyze COP of different refrigeration cycles with different methods of refrigeration using different refrigerants	2				2						
			CO2	Analyze the performance of Vapor Compression Refrigeration with modification of cycle and its components	2				2						
			CO3	Understanding the working of Cascade systems for low temperature Production and of VAR system	1										
			CO4	Analyze cooling load for comfort and industrial air conditioning on basis of processes on psychometric charts and its components.	2				2						
13ME345	COMPUTER AIDED DESIGN	3	CO1	Understand the Fundamentals of CAD and display devices	1										1
			CO2	Apply the concept of geometric modeling	2										2

			CO3	Able to apply concept of Surface and solid modeling	2										2
			CO4	Application of various Geometric transformations	2										2
13ME366	MODERN MANUFACTURING PROCESSES	3	CO1	Select an appropriate mechanical energy based machining processes for suitable application.		2	2		2			2			
			CO2	Select an appropriate chemical energy and electro-chemical energy based machining processes for suitable application.	2	2	2		2			2			
			CO3	Select an appropriate thermo electric energy based machining processes for suitable application.		2	2		2			2			
			CO4	Select an appropriate advanced welding and advanced forming processes for suitable application.		2	2		2			2			
13ME357	MODELLING AND SIMULATION OF MECHATRONIC SYSTEMS	3	CO1	Build mathematical models of mechatronic systems comprising of combinations of mechanical, electrical, pneumatic/ hydraulic and thermal systems.					3						3
			CO2	Represent system models using transfer function and /or state space approach.					2						2
			CO3	Understand and apply system identification techniques for synthesizing system models					2						2
			CO4	Evaluate time and frequency response of systems					3						3
13ME341	ADVANCED STRENGTH OF MATERIALS	3	CO1	Analyze Indeterminate Beams	2				2						
			CO2	Analyze Curved Beams and Beams subjected to Unsymmetrical bending	2				2						
			CO3	Apply Energy methods to find deflections in simple Structures	2				2						

			CO4	Analyze Stresses in Rotating members and Thick cylinders	2				2						
13ME337	COMPUTATIONAL FLUID DYNAMICS	3	CO1	Understand the Fundamentals of CFD and governing equations	2										2
			CO2	Understand different CFD techniques and methods of solutions	2										2
			CO3	Understand time integration methods and grid generation	2										2
			CO4	Solving N-S equations and understand turbulence modeling	2										2
13ME402	MACHINE DESIGN	4	CO1	Design and selection of various belt and chain drives			3								
			CO2	Design and Selection of the suitable bearing for the given loading condition			3								
			CO3	Analyze kinematic and dynamic aspects in design of brakes, clutches and IC engine components			3								
			CO4	Design and analysis of different types of gear drives			3								
			CO5	Analyze machine elements using analysis software											2
13ME403	INDUSTRIAL ENGINEERING TECHNIQUES	4	CO1	Apply various work-study techniques to determine the standard time and efficiency.											2
			CO2	Analyze various quality control techniques for bringing out the best quality output.											2
			CO3	Apply various plant layout and production scheduling techniques to optimize productivity.											2
			CO4	Calculate future demand for the product in the market by applying appropriate forecasting technique.											2

13ME346	VEHICLE DYNAMICS	3	CO1	Analysis of loads acting on vehicle with different conditions and Understanding of Aerodynamics					2						
			CO2	Understanding of tires and Analysing performance of vehicle on braking conditions					2						
			CO3	Understanding of Multi Body dynamics and Analyzing roll over					2						
			CO4	Analysis of steering and suspension systems					2						
13ME349	FATIGUE, CREEP AND FRACTURE	3	CO1	Assess the failure of unflawed structural components		2			2						
			CO2	Assess the fatigue life of structural components under the specified load spectrum		2			2						
			CO3	Evaluate the fracture toughness and assess the life of flawed structural components		2			2						
			CO4	Assess the life of structural components under creep		2			2						
13ME358	SIGNAL PROCESSING IN MECHATRONIC SYSTEMS	3	CO1	Understand the sampling theorem and its importance in the digital world	1										
			CO2	Understand the concepts of z-transform, dft, fft algorithms and their computations, Design of fir and iir filters	1										
			CO3	Analyze multirate signal processing ,decimation, interpolation, subband coding					2						
			CO4	Analyze various Texas processor and application of DSP to speech and radar signal processing					2						
13ME334	POWER PLANT ENGINEERING	3	CO1	Understand the working of system and subsystems of Hydro power plant and to Draw their layout diagrams.					2						
			CO2	Understand the working of system and subsystems of Diesel and Thermal power plants and to draw their layout diagrams.					1						

			CO3	Understand the working of system and subsystems of Nuclear and Non-conventional energy sources power plants and to draw their layout diagrams					1						
			CO4	Understand power plant economics, methods of tariff and conservation of energy.					2						
13ME364	AUTOMIBILE CHASSIS AND BODY ENGINEERING	3	CO1	Understand different car body types and safety in car	1										
			CO2	Understand construction of bus bodies and commercial vehicles	1										
			CO3	Understand vehicle aerodynamics, body loads and noise reduction techniques	1										
			CO4	Understand different materials used in the vehicle body construction and painting	1										
13ME367	CELLULAR MANUFACTURING	3	CO1	Understand the concept of group machining, objectives, terminologies, factors influencing success, implementation issues, organizational and behavioral issues in the implementation of Cellular Manufacturing.	1										
			CO2	Apply cell formation techniques to identify cells and part families.					2						
			CO3	Evaluate solutions obtained by cell formation techniques using performance measures					2						
			CO4	Apply production control activities to cellular manufacturing problems.					2						
13ME359	FUZZY SETS AND ARTIFICIAL INTELIGENCE	3	CO1	Basic concepts of Fuzzy Sets, Fuzzy Logic, Operations on Fuzzy sets and Probability and Possibility Measures.											2
			CO2	Fuzzy Methodologies, Relations and Applications of Fuzzy sets in various domains.											2
			CO3	Introduction to AI, Production system , Interpret the Problems and search related to AI and Predicate Calculus											2

			CO4	Knowledge Representation, Semantics Nets, Frames, and developing Knowledge base expert systems for various applications.												2
13ME369	ENGINE SYSTEMS AND PERFORMANCE	3	CO1	Review analysis on Engine Basic Theory and Different Engine Technologies		2										
			CO2	Performance Analysis on Mixture preparation systems for SI and CI Engines, Combustion in Engines		2										
			CO3	Analysis of Engine Friction and lubrication, Cooling Systems, Speed Governing and Air Induction		2										
			CO4	Performance Analysis of Engine Exhaust and Emission, Engine Testing and Performance, New Engine technologies		2										
13ME368	COMPUTER INTEGRATED MANUFACTURING	3	CO1	Apply the concept of group technology to identify part families and applications												2
			CO2	Understand the concepts of Flexible Manufacturing System and computerized manufacturing planning systems	1											
			CO3	Comprehend Computer aided quality control and automatic identification techniques	1											
			CO4	Understand aspects of Computer networks and trends in Manufacturing systems	1											
13ME360	ENGINEERING SMART MATERIALS FOR MECHATRONIC APPLICATIONS	3	CO1	Piezo electric materials to Sensing & Actuation	2											
			CO2	Shape memory alloys(SMA) to Sensing & Actuation	2											
			CO3	Electro-active polymers(EAPs) to Sensing & Actuation	2											
			CO4	Magnetostrictive materials for Sensing & Actuation. Future applications, trends of smart materials and smart material based actuator technology										2		

13ME374	OPERATIONS MANAGEMENT	3	CO1	Classify and explain the benefits of various production systems, layouts and usage of material handling equipment.												1
			CO2	Calculate future demand for the product in the market by applying appropriate forecasting technique.					2							2
			CO3	Apply various production scheduling techniques to optimize productivity.					2							2
			CO4	Analyze various quality control techniques for bringing out the best quality output.					2							2
13ME344	VIBRATIONS ENGINEERING	3	CO1	Develop a mathematical model of a vibrating system and Perform detailed analysis of the response of 1DOF undamped systems under free vibration regime	2											
			CO2	Perform detailed analysis of the response of 1DOF damped systems under free vibration regime					2							
			CO3	Perform detailed analysis of the response of 1DOF systems under forced vibration regime					2							
			CO4	Perform detailed analysis of the response of two and multi DOF systems under both free and forced vibration regimes					2							
12OE442	MECHATRONICS	3	CO1	Identify appropriate sensors, Identify appropriate actuation system for a given application.			2									
			CO2	Identify appropriate microcontroller for a given application and to build a mathematical Model of system for evaluating open Loop system performance and behavior.					2							
			CO3	Suggest an appropriate closed loop control strategy to attain the desired system behavior					2							
			CO4	Suggest a Mechatronic product design for a given application and evaluate its performance.				3								
12OE443	ROBOTICS	3	CO1	Analyze existing robotic systems with respect to their anatomy, type, performance specifications, end effectors etc.			2									

			CO2	Suggest a robotic system design with respect to the suitable sensors, actuators for an intended application and simulate its performance	3											
			CO3	Analyze robot manipulator performance with respect to digital control architecture comprising of PLC's /Microcontroller for an application			2									
			CO4	Comprehensive understanding and identification of suitable Robotic system	2											
			CO4	Applying basic methods of photography for Engineering problems.					2							

K L UNIVERSITY

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Constituent College KLCE Accredited by NAAC with A - Grade
Approved by A.I.C.T.E. Accredited by N.B.A. ISO 9001-2000 Certified

UNIVERSITY

Vision

To be a globally renowned university.

Mission:

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

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DEPARTMENT VISION

To create a platform to sculpture the learner's too professional by binding innovative, international standardized education with leadership, entrepreneur skills and applied research.

DEPARMENT MISSION

1. To simplify the hospitality education.
2. To provide effective learning through goal orientation in promoting innovative skills.

3. To create entrepreneurs with international industrial standards.

4. To collaborate with national & international hospitality organizations.

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PROGRAM EDUCATION OBJECTIVES (PEO's)

1. Make students to be leaders in hospitality industry through industry immersion and national and international linkages in order to support business in the field of relevance.
2. To intensify student`s knowledge and skills with instruction based on international standards, to produce quality graduates with balanced knowledge, skills and industry exposure in catering, hotel and management.
3. Inculcate leadership skills needed for integration of hotel and restaurant development, to demonstrate community involvement in travel and tour operation, airlines and other related industries to strengthen their knowledge and skills.

PROGRAM OUTCOMES (PO's)

a. Knowledge of techniques and equipment for planting, growing, and harvesting food products (both plant and animal) for consumption, including storage/handling techniques.
b. Knowledge of raw materials, production processes, quality control, costs, hygiene and sanitation and other techniques for maximizing the effective manufacture and distribution of goods.
c. Knowledge of business and management principles involved effectively in strategic planning, resource allocation, human resources modelling, leadership technique, production methods, and coordination of people and resources.
d. Knowledge of principles and processes for providing customer and personal services. This includes customer needs assessment, meeting quality standards for services, and evaluation of customer satisfaction

e. Knowledge of economic and accounting principles and practices, the financial markets, banking, analysis and reporting of financial data involved in industrial sectors.
f. Knowledge of principles and procedures for personnel recruitment, selection, training, compensation and benefits, labour relations and negotiation, and personnel information systems**.**
g. Knowledge of the structure and content of different language including the meaning and spelling of words, rules of composition, and grammar.
h. Knowledge of principles and methods for showing, promoting, and selling products or services. This includes marketing strategy and tactics, product demonstration, sales techniques, and sales control systems.
i. Knowledge of principal methods of cleaning, controlling, recycling process, maintenance of equipment's, latest technology and its usage, safety measures to taken in hotel industry.
j. Knowledge on Tourism, hospitality industry history, sales, promotions, Audit, general knowledge, share market, excellent skill to communicate and computer knowledge.

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PEO's - MISSON

PEO's	To simplify the hospitality education **(M 1)**	To provide effective learning through goal orientation in promoting innovative skills **(M 2)**	To create entrepreneurs with international industrial standards **(M 3)**	To collaborate with n ational & international hospitality organizations **(M 4)**
Make students to be leaders in hospitality industry through industry immersion and national and international linkages in order to support business in the field of relevance.	✓			
To intensify student`s knowledge and skills with instruction based on international standards, to produce quality graduates with balanced knowledge, skills and industry exposure in catering, hotel and management.		✓	✓	
Inculcate leadership skills needed for integration of hotel and restaurant development, to demonstrate community			✓	✓

involvement in travel and tour operation, airlines and other related industries to strengthen their knowledge and skills.				

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PO's – PEO's MATRIX

PO's	PEO - 1	PEO - 2	PEO -3
a	✓		
b		✓	
c		✓	
d	✓		
e			✓
f			✓
g		✓	

h			✓
i	✓		
j			✓

CO's (Courses) - PO's Mapping

S.No	Course Code	Course Title with Code	Course Outcomes	Description of Course Outcomes	PROGRAM OUTCOME(Pos)									
					PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO 10
1	11BH11K0	English Language Skills I	CO1	To develop the skills of the professional undergraduate students for proper self-expression.							1			
			CO2	To develop social communication, spoken English, correct pronunciation, voice modulation and business etiquettes.							2			
			CO3	To develop the students should improve their personality,							2			
			CO4	To develop communication skills and enhance their self-confidence.							2			
2	13BH11C6	Introduction to Food Production	CO1	Understand the professionalism of being an educated chef and the concepts of developing modern cookery practices.	1									

			CO2	Understand the kitchen hierarchy and its coordination with stakeholders [Other department]								2		
			CO3	Understand the principles of cooking and basic classification in identifying edible commodities in kitchen	2									
			CO4	Understand the basic bakery concepts this includes the measuring of ingredients, physical & chemical changes during baking.	2									
3	13BH11C7	Introduction to Food & Beverage Service	CO1	Able to understand the basic of Food and Beverage service Industry.	1									
			CO2	Knowledge on Organization structure duties and responsibilities.				2						
			CO3	Type of Restaurant and Equipment used in restaurant.									2	
			CO4	Skills required for types of service.	2									
4	13BH11C8	Introduction to House Keeping	CO1	Understand & perform the basic responsibilities of a House keeper			1							
			CO2	Remember & identify the organization structure and can design a House keeping layout.				2						
			CO3	Understand & perform the cleaning					2					

				procedures of various equipments										
			CO4	Remember and identify the types of guest rooms.			2							
5	13BH11C9	Introduction to Front Office	CO1	Importance of Tourism & Hotel definition, Introduction of its growth			1							
			CO2	Classifies the Hotel & Types of rooms in hotels				2						
			CO3	Organizational Structure of Hotel & departments					2					
			CO4	Sections & layout of Front Office department & Staff			2							
6	15BH11I0	Introduction to Information Technology	CO1	To develop basic paper for Business Administration students to familiarize with computer		1								
			CO2	To develop applications in the relevant fields and exposes them to other related papers of IT.		2								
7	11BH11K6	Contemporary India	CO1	To develop clear understanding about basic features of economy			1							
			CO2	To develop national movement and social systems and values.					2					
Name of The Program: BHM - I Year - II Sem														

1	11BH12K0	English Language Skills II	CO1	To develop the skills of the professional undergraduate students for proper self-expression.						2				
			CO2	To develop social communication, spoken English, correct pronunciation, voice modulation and business etiquettes.						2				
			CO3	To develop the students should improve their personality,						3				
			CO4	To develop communication skills and enhance their self-confidence.						3				
2	14BH12C6	Principles of Food Production	CO1	Food Production is an integral part of the Hospitality Industry.	1									
			CO2	To prepare the students to cater to the need of the industry									2	
			CO3	It is important to inculcate in them sound knowledge	2									
			CO4	The principles of Food Production so that they can be put to use in an efficient & effective way.	3									
3	14BH12C7	Principles of Food & Beverage	CO1	The courses will give the students a comprehensive knowledge	1									
			CO2	To develop technical skills				2						

		Service	CO3	The basic aspects of food and non-alcoholic									2	
			CO4	To develop beverage service operations in the Hotel Industry.	3									
4	14BH12C8	Principles of House Keeping	CO1	The subject aims to establish the importance of House Keeping			1							
			CO2	Its role in the hospitality Industry.				2						
			CO3	It also prepares the student to acquire basic knowledge and skills					2					
			CO4	For different tasks and aspects of housekeeping.			3							
5	14BH12C9	Principles of Front Office	CO1	This course aims to establish the importance of Front Office within the hospitality industry			1							
			CO2	It also prepares the student to acquire basic skills and knowledge necessary				2						
			CO3	To successfully identify the required standards					2					
			CO4	This area and to consider all aspects of this department.			3							
6	14BH12C0	Hotel Accountancy	CO1	This subject intends to impart students the basic knowledge of Hotel Accounting		2								
			CO2	Required for the Hospitality Management		2								

			CO3	To prepare them to comprehend and utilize this knowledge									2	
			CO4	The day-to-day operations of the organization.									3	
Name of The Program: BHM - II Year - I Sem														
1	14BH21C6	Food Production Operations	CO1	Based on the sound knowledge of commodities and principles and methods of cooking	1									
			CO2	It is desired to prepare students to evolve good understanding and prepare Indian regional menus									2	
			CO3	In large quantities to suit the occasion	2									
			CO4	The course further introduces the students to the concepts of bakery & confectionery.	3									
2	14BH21C7	Food & Beverage Services Operations	CO1	The courses will give a comprehensive knowledge of the various alcoholic beverage	2									
			CO2	Used in the Hospitality Industry.									2	
			CO3	It will give an insight into their history, manufacture, classification	2									
			CO4	And also to develop technical and specialized skills in the service of the same.	3									

3	14BH21C8	Accommodation Operations	CO1	This course aims to establish the importance of Accommodation operations	1									
			CO2	Within the hospitality Industry				2						
			CO3	It also prepares the student to acquire basic skills and knowledge necessary to successfully identify the required standards									2	
			CO4	In this area and to consider all aspects of cost control and establishing profitability.	2									
4	14BH21K0	Hotel Laws	CO1	Understanding the concept of Indian hotel industry and its first growth cycle. Hotel Legal issues and Origin of Hotel Law			2							
			CO2	Understanding the accurate Laws in Hotel Operations, Laws related to Employees and Guests and Laws related to Food and Beverage.				2						
			CO3	Understanding the Laws related to Public Health and Safety					2					
			CO4	Understanding the concept of Indian hotel industry and it's first growth cycle. Hotel Legal issues and Origin of Hotel Law			3							
5	14BH21K1	Nutrition & Hygiene	CO1	This course aims to develop awareness of the importance of hygiene,			2							

			CO2	Sanitation and food safety in hotel industry.				2						
			CO3	And also the student can able to know about the nutrients that are available					2					
			CO4	In the food materials and how much they are required in our day to day life.			3							
6	14BH21K2	Food & Beverage Control	CO1	This course aims to establish the importance of food and beverage control within the hotel Industry		2								
			CO2	It also prepares the student to acquire basic skills and knowledge		2								
			CO3	Necessary to successfully identify the required standards									2	
			CO4	In this area and to consider all aspects of cost control and establishing profitability.									3	
7	11BH21K6	Environmental Studies	CO1	To make students aware to environmental problems and issues			2							
			CO2	To inculcate values of Environmental ethics amongst the students.					2					
Name of The Program: BHM -II Year - II Sem														
1	14BH22C6	Food Production	CO1	Based on the sound knowledge of commodities and principles and methods of	1									

		Management		cooking										
			CO2	Cooking it is desired to prepare students to evolve good understanding and prepare Indian regional menus									2	
			CO3	In large quantities to suit the occasion	2									
			CO4	The course further introduces the students to the concepts of bakery & confectionery.	3									
2	14BH22C7	Food & Beverage Services Management	CO1	This course will give a comprehensive knowledge of the various alcoholic beverage used in the Hospitality Industry.	2									
			CO2	It will give an insight into their history									2	
			CO3	Manufacture, classification, and also to develop	2									
			CO4	Technical and specialized skills in the service of the same.	3									
3	14BH22C8	Accommodation Management	CO1	This course aims to establish the importance of Rooms Division within the hospitality Industry.	1					1				
			CO2	It also prepares the student to acquire skills and knowledge necessary				2						

			CO3	To successfully identify the required standards									2	
			CO4	Control Systems in this area and to consider managerial decision-making aspects of this department	3									
4	14BH22K0	Hotel Engineering	CO1	The subject will provide information regarding the basic services and different types of systems in hotel industry.			2							
			CO2	This will help the students to understand plan,				2						
			CO3	Co-ordinate and integrate the functions of engineering departments					2	2				
			CO4	For overall operations and assist in the management of hotel.			3							
5	14BH22K1	Perspectives of Management	CO1	To make the students understand the concepts of management			2							
			CO2	Their Practical application in the hospitality industry.				2						
6	11BH22L0	Basic French	CO1	To create awareness about the importance of French in the hotel operations		2								
			CO2	And to acquire the correct pronunciation of		2								

				French terminology.										
			CO3	To use standard phrases in French in hotel operations.									2	
			CO4	To integrate the French curriculum with the core syllabus of the course.									2	
Name of The Program: BHM - III Year - I Sem														
1	14BH31C6	Advanced Food Production	CO1	This course develops the knowledge	1									
			CO2	Understanding of the international cuisine amongst students.									2	
2	14BH31C7	Advanced Food & Beverage Services	CO1	The students will gain a comprehensive knowledge	2									
			CO2	To develop technical skills									2	
			CO3	To develop aspects of Specialized Food and Beverage services	2									
3	14BH31K0	Soft Skills	CO1	To develop the personality and communication skills of the student	1									
			CO2	To prepare him for campus interviews				2						
			CO3	To develop challenges in personal and professional life.									2	

4	14BH31K1	Hospitality Services Marketing	CO1	The subject aims to make the students understand importance of marketing			2								
			CO2	To develop Hospitality Industry, concepts of the marketing,				2							
			CO3	To develop buying behaviors, market segmentation					2						
			CO4	To develop marketing mix strategies for effective marketing of the hotel industry.			3								
5	14BH31K2	Human Resource Management	CO1				2								
			CO2					2							
			CO3						2						
			CO4				3								
6	14BH31K3	Travel & Tourism	CO1	To inculcate a sense of importance and establish a link between the tourism industry and the hotel industry		2									
			CO2	to highlight tourism industry as an alternative career path.		2									
Name of The Program: BHM - III Year - II Sem															
1	14BH32N0	Intensive Internship													

K L UNIVERSITY
DEPARTMENT OF BIOTECHNOLOGY
PROGRAM DEVELOPMENT DOCUMENT
M.TECH BIOTECHNOLOGY
2013

Vision of University:

To be a globally renowned university.

Mission of University:

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

Vision of Department:

To be a globally renowned leader in education, research and extension activities in emerging areas of biological engineering and related fields.

Mission of Department:

To train the leaders and innovators of tomorrowto establish as successful professionals to address global biotechnological requirements.

Program Educational Objectives

1. Illustrate the importance of techniques in bioengineering.
2. Illustrate practical application of various instrumentation methods in bioengineering sciences.
3. Understand the importance of professional and ethical issues in human and animal health.
4. Demonstrate the ability to work independently and in groupin projects related to biosciences.

ProgramOutcome's

a. Knowledge of basic and advanced concepts and techniques in bioengineering sciences.
b. Practical and hands-on-training in various instrumentation methods and tools used in bioengineering.
c. Knowledge of the applications of specific technologies or approachesleading to the design of a method or formulation.
d. Knowledge of professional, ethical and societal issues in industry and research fields.
e. Knowledge of work plan and management strategies related to the Science and Technology which includes data interpretation, preparing report, compilation and submission.

MAPPING OF PEOs with MISSION OF THE DEPARTMENT:

S.No	Description of PEOs	Key Components of Mission	
		M 2	**M 3**
		Training future professionals and innovators of tomorrow	Conducting fundamental and advanced research
PEO 1	Illustrate the importance of techniques in bioengineering.	✓	✓
PEO 2	Illustrate practical application of various instrumentation methods in bioengineering sciences.	✓	✓
PEO 3	Understand the importance of professional and ethical issues in human and animal health.		✓
PEO 4	Demonstrate the ability to work independently and in group in projects related to biosciences.	✓	✓

MAPPING OF POs/PSOs with PEOs:

	Key Components of POs and PSOs	Description of PEO			
		Illustrate the importance of techniques in bioengineering.	Illustrate practical application of various instrumentation methods in bioengineering sciences.	Understand the importance of professional and ethical issues in human and animal health.	Demonstrate the ability to work independently and in group in projects related to biosciences.
		PEO 1	**PEO 2**	**PEO 3**	**PEO 4**
a	Knowledge of basic and advanced concepts and techniques in bioengineering sciences.	✓	✓	✓	✓
b	Practical and hands-on-training in various instrumentation methods and tools used in bioengineering.	✓	✓		✓
c	Knowledge of the applications of specific technologies or approaches leading to the design of a method or	✓	✓		✓
d	Knowledge of professional, ethical and societal issues in industry and research fields.	✓		✓	✓

e	Knowledge of work plan and management strategies related to the Science and Technology which includes data interpretation, preparing report, compilation and submission	✓	✓		✓

I/II M.TECH FIRST SEMESTER SUBJECTS LIST									
					Program Outcomes				
Course Code	Course Title	Credits	CO Number	Description of the course outcomes	a	b	c	d	e
12BT501	MATHEMATICS AND BIO STATISTICS	4	CO1	Analyze theimportance of numerical methods	2				
			CO2	Identify the role of linear differential equations	1				
			CO3	Illustrate the role of various data interpretation					1
			CO4	Interpret the outcomes of correlation and regression data analysis					2
			CO5	Illustrate about RDB, ANOVA in agriculture and Hospital cases					2
12BT502	BIOCHEMICAL REACTION ENGINEERING	5	CO1	Understand and analyze the role of biochemical reactions in biological systems.	1				
			CO2	Interpret various designs and operations of bioreactors.	2				
			CO3	Illustrate various mass-tranfer studies.		1			
			CO4	Anakyze various kinetic models of heterogeneous systems.		1			
			CO5	Evaluate various RTD methods and models		2			

12BT503	MOLECULAR BIOLOGY AND rDNA TECHNOLOGY	4	CO1	Acquire the knowledge of DNA damage and repair mechanisms.	1				
			CO2	Interpret the role of transcription factors	2				
			CO3	Identify the role of Gene regulation in prokaryotes and eukaryotes		1			
			CO4	Identify the role of YAC, BAC in gene cloning		2			
			CO5	Demonstrate PCR and other molecular methods.		2			
12BT504	APPLIED BIOINFORMATICS	5	CO1	Knowledge about SNPs, ESTs and GSS	1		2		
			CO2	Illustrate the role of 3D models of protein structures and their modeling	1				
			CO3	Computational understanding of MASCOT, GFS and other tools			2		
			CO4	Illustrate the role of microarray processing and analysis			2		
			CO5	Computational methods on metabolic networks and SBML			2		
12BTE531	FOOD BIOTECHNOLOGY	3	CO1	Understand the role of microbes in food technology	1				
			CO2	Understand the food processing and preservation methods	1				
			CO3	understand the concept of food preservation	1				

			CO4	Identify various methods involved in food storage and preservation	2				
			CO5	Demonstrate growth characteristics and rheological properties of microbes in food technology	2				
12BTE530	MEDICAL BIOTECHNOLOGY	3	CO1	Understand the role of different methods of organ transplant and production of therapeutics	1			1	
			CO2	Identify the role of various medical diagnosis	1				
			CO3	Knowledge about gene tranfer methods	1				
			CO4	Interpret the importance of stemcell technologies and hybridoma technologies.	2			1	
12BT501	PLANT AND ANIMAL BIOTECHNOLOGY	5	CO1	Importance of tissue culture and media		1		1	
			CO2	Analyze the role of micropropogation and secondary metabolites		2		2	
			CO3	Knowledge about gene tranfer methods		1			
			CO4	Analyze animal cell culture and growth kinetics		2		2	
			CO5	Demonstrate plant and animal cell culture methods				2	
12BT502	IMMUNOTECHNOLOGY	4	CO1	Understand the concept of immune responses	1	1			
			CO2	Understand various immunological disorders	1	1			

			CO3	Understand various animal models in immunological methods	1	1			
			CO4	Analyze the importance of disease diagnosis and vaccines	2	2			
			CO5	Understand the role of chimeric antibodies in disease prevention	1	2			
12BT503	BIOREACTOR MODELING AND SIMULATION	4	CO1	Knowledge about emperical and modeling approaches	1				
			CO2	Understand the role of MM Kinetics	1				
			CO3	Analyze batch modeling studeis	2				
			CO4	Interpret structured and unstructured kinetic models	2				
			CO5	Evaluate various bioprocess simulation studies			3		
12BT504	DOWNSTREAM PROCESSING	4	CO1	Acquire the knowledge of bioseparation		1			
			CO2	Acquire the knowledge of cell disruption methods		1			
			CO3	Analyze the role of different chromatographic separations		2			
			CO4	Understand the importance of various formulation strategies			2		
			CO5	Acquire the knowledge about polishing and techniques		2			

12BTE531	MOLECULAR MODELING AND DRUG DESIGNING	3	CO1	Analyze the importance of emperical force fields and molecular mechanisms.			1		
			CO2	Analyze the role of various molecular dynamic simulation methods			1		
			CO3	Perform Monte-Carlo and Molecular dynamics simulations			2		
			CO4	Analyze applications of drug design			3		
12BTE530	STEM CELL TECHNOLOGY	3	CO1	Describe the basic concepts of Stem Cells				1	
			CO2	Understand Stem Cell Characterization				1	
			CO3	Understand Tissue Engineering				1	
			CO4	Applications of Biopharming				2	

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K.L.UNIVERSITY

SCHOOL OF CIVIL AND MECHANICAL SCIENCES

Department of Civil Engineering

K L UNIVERSITY:

Vision

- To be a globally renowned university

Mission

- To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

VISION, MISSION, LONG TERM GOALS, SHORT TERM GOALS, PEO's PO's and GA's OF DEPARTMENT:

Vision

- To impart knowledge and excellence in Civil Engineering with global perspectives to the student community and to make them ethically strong engineers to build our nation.

Mission

- Our mission is to provide holistic development of student community to meet the ever changing needs of civil engineering industry and to be involved in forward looking research and consultancy useful to society.

M. Tech. (Structural Engineering) - CIVIL ENGINEERING PROGRAMME

PROGRAM EDUCATIONAL OBJECTIVES (PEOs):

- Demonstrate knowledge in broad areas of Structural Engineering
- Demonstrate a depth of knowledge in a chosen/focus area of Structural Engineering
- Demonstrate knowledge of contemporary issues in their chosen/ focused area
- Demonstrate the ability to complete a technical project independently

PROGRAMME OUTCOMES (POs):

On completing the M. Tech. (Structural Engineering) – Civil Engineering Programme successfully the students will exhibit the following capabilities:

1. knowledge of a broad range of structural methodologies and underlying civil engineering, commonly used in the development and analysis of Structural Engineering systems.
2. Knowledge of fundamental design issues relevant to Structural Engineering and an understanding of how to formulate and analyse design solutions in various engineering contexts.
3. In-depth knowledge of one or more of the following (depending of selection of option modules and project area): specific engineering systems, design methods, modeling techniques.
4. Knowledge of basic research and development principles and practices relevant to main stream engineering industry.
5. Knowledge of key professional, safety and ethical issues arising in modern engineering industry.
6. Knowledge of time management and work planning issues related to the organization implementation and successful completion, including reporting, of an individual, masters level, Engineering based projects.

PROGRAMME SPECIFIC OUTCOMES (PSOs) - M. Tech. (Structural Engineering)

1. Function as design consultants in construction industry for the design of Civil Engineering structures.
2. Provide sustainable solutions to the Civil Engineering Problems.

K L UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING MAPPING OF PEOs *vs.* Mission Statement (Structural ngineering)

		Mission Statement		
		To provide holistic development of student to meet the ever changing needs of civil engineering industry	To be involved in forward looking research	To be involved in consultancy useful to society
	Programme Educational Objectives	**√**	**√**	**√**
1	Demonstrate knowledge in broad areas of Structural Engineering	**√**	**√**	**√**
2	Demonstrate a depth of knowledge in a chosen/focus area of Structural Engineering	**√**	**√**	**√**
3	Demonstrate knowledge of contemporary issues in their chosen/ focused area.	**√**		**√**
4	Demonstrate the ability to complete a technical project independently	**√**	**√**	**√**

K L UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING

MAPPING OF POs *vs.* PEOs (Structural Engineering)

		Programme Educational Objectives			
		Demonstrate knowledge in broad areas of Structural Engineering	Demonstrate a depth of knowledge in a chosen/focus area of Structural Engineering	Demonstrate knowledge of contemporary issues in their chosen/ focused area.	Demonstrate the ability to complete a technical project independently
	Program Out Comes				
1	knowledge of a broad range of structural methodologies and underlying civil engineering, commonly used in the development and analysis of Structural Engineering systems	**√**	**√**		**√**
2	Knowledge of fundamental design issues relevant to Structural Engineering and an understanding of how to formulate and analyse design solutions in various engineering contexts	**√**	**√**		**√**
3	In-depth knowledge of one or more of the following (depending of selection of option modules and project area): specific engineering systems, design methods, modeling techniques	**√**	**√**		**√**
4	Knowledge of basic	**√**	**√**		**√**

	research and development principles and practices relevant to main stream engineering industry.				
5	Knowledge of key professional, safety and ethical issues arising in modern engineering industry.	√	√		√
6	Knowledge of time management and work planning issues related to the organization implementation and successful completion, including reporting, of an individual, masters level, Engineering based projects.	√	√		√
PSO1	Function as design consultants in construction industry for the design of civil engineering structures.	√	√		√
PSO2	Provide sustainable solutions to the Civil Engineering Problems.			√	

K L UNIVERSITY

DEPARTMENT OF CIVIL ENGINEERING

MAPPING OF Courses & Cos *vs.* POs (Structural Engineering)

Course Code	Course Title	Description of the Course Outcome	a	b	c	d	e	f	PSO 1	PSO 2
11CE 501	Applied Mathematics	Understand the Laplace Transformations and Fourier Transformations concept	2						1	
		Understand the Elliptic Equation concept for both Laplace Transformations and Fourier Transformations	2						1	
		Understand the concept of Calculus of Variations	2						1	
		Understand the concept of Eigen value problems and numerical integration	2						1	
11CE502	Theory of Elasticity	Analysis of Two-dimensional problems in rectangular coordinates	2						2	
		Analysis of Two-dimensional problems in polar coordinates	2						2	
		Understand the energy principles	2						2	
		Understand and analyse the torsion related problems	2						2	
11CE503	Structural Dynamics	Solve response of free and forced vibrations			2				2	
		Solve response to Arbitrary, Step and Pulse Excitations (SDOF)			2				2	
		Solve Earthquake Response of Linear Systems (SDOF)			2				2	
		Build Generalized Single Degree of Freedom Systems			2				2	

		Solve response of Multi -degree of freedom systems (MDOF)			2				2	
11CE504	Advanced Prestressed Concrete	Understand the concepts of prestressed concrete and analyze the prestressed concrete beams.	2			2	2		3	
		Analyze losses in prestressed concrete and deflection of the prestressed concrete members	2			2	2		3	
		Design reinforcement for Ultimate shear, torsion and bending of prestressed concrete members.	3		3	2			3	
		Design end blocks as per IS 1343 recommendations.	3		3	2			3	
		Design of prestressed members, composite sections ,continuous prestressed beams	3		3	2			3	
11CE531	Repair and rehabilitation of structures	Understand the concept of Deterioration of structures with aging, Need for rehabilitation	1							2
		Understand the damage level of structures affected due to seismic loads, Damage assessment and evaluation models	1	1						2
		Understand procedure of rehabilitation methods like Grouting; Detailing; Imbalance of structural stability	2	2						2
		Understand the retrofitting methodology and procedure	2	2						2
11CE532	Design of Offshore structures	Understand the Wave Theories and Forces On Offshore Structures	2						3	
		Understand the Offshore Soil and Structure Modelling	2						3	
		Analysis of Offshore Structures	2						3	
		Design of Offshore Structures	2						3	

11CE541	Geotechnical Earthquake Engineering	Knowledge of the seismic phenomenon, its occurrence, tectonic theories, seismic waves and their motion in different media and measurement of ground motions. Analysis skills of 1-D ground responses using linear and non-linear approaches	1						2	
		Ability to analyze the seismic hazard through deterministic and probabilistic approaches. Ability of modifying the actual ground motion records and their time and frequency domain generation.		2					2	
		Knowledge of dynamic soil properties and their measurements using field and laboratory tests.	2	2					2	
		Knowledge of the liquefaction phenomenon and its effects and the remedial measures to be taken for soil improvement.	1						2	
11CE542	Stability of structures	Introduction to buckling of columns	2						3	
		Analysis of lateral buckling of beams	2						3	
		Analysis of lateral buckling of plates and shells	2						3	
		Understanding the Mathematical treatment of stability problems	2						3	
11CE601	Finite Element Analysis	Understand the Basic Finite Element Concepts	2	2		2			2	
		Analysis of Trusses, Beam Bending, Structural Frames and Column buckling using Finite Element Methods	2	2		2			2	
		Analysis of Higher order elements for one dimensional problems and Isometric quadrilateral elements and triangular elements	2	2		2			2	
		Analyse the applications based on general two dimensional boundary value problem	2	2		2			2	
		Demonstrate the ANSYS software to develop the models using Finite				2		2	2	

		element method								
11CE602	Bridge Engineering	Introduction to different types of bridges and codal provisions for designing the bridge components.	1						3	
		Analysis and Design of slab Culvert.	2				2		3	
		Analysis and Design of T-Beam, sub-structure components and bearings	2				2		3	
		Understanding the designing of cable supported bridges.	2				2		3	
11CE603	Earthquake resistant design of structures	Understanding the designing of cable supported bridges.	1						3	
		Understand thesystem of base isolation in structures for resistance towards earthquakes and general detailing requirements of ductile structure.	1						3	
		Analyze a structure for earthquake forces onto the structure under static and dynamic behavior.		2					3	
		Design the structure for earthquake forces on 2 –storey building		2					3	
11 CE 604	Theory of Plates and Shells	Derive the pure bending and curvature of plates	2	2		2			2	
		Derive the differential equation for laterally loaded rectangular plates				2		2	2	
		Derive the deformation of shells without bending	1						2	
		Understand the general theory of Cylindrical shells	2				2		2	
11 CE 631	Industrial Structures	Understand the Planning and Functional Requirements of Industrial Building				2		2	2	
		Analysis and Design of different type of Industrial Buildings	1						2	
		Design of Powerplant and transmission Structures	2				2		2	

		Design of Auxilliary Structures				2		2	2	
11 CE 632	Design of Tall Structures	Understanding the design criteria of Tall structures	1						3	
		Understanding the Loadings On Tall Structures	2				2		3	
		Understanding the behaviour of Rigid-Frame Structures and Shear Wall Structures		2					3	
		Understanding the behaviour of Tubular Structures		2					3	
		Dynamic analysis on Tall structures		2					3	
11 CE 633	Optimization of Structures	Understanding the Basics of engineering analysis and design	1						2	
		Understanding the optimization methods	1						2	
		Introduction to variational methods of sensitivity analysis, shape sensitivity		2					2	
		Introduction to genetic algorithm and simulated annealing		2					2	
11 CE 641	Advanced Design of structures	Analysis and design of portal frames, Design example for hinged and fixed frame and Design of Reinforced concrete deep beams	1						3	
		Design of Elevated water tanks; Earthquake resistant design	1						3	
		Introduction to plastic analysis		2					3	
11 CE 642	Fracture Mechanics	Understanding the basic concepts of Fracture and Linear Elastic Fracture Mechanics (LEFM)	1						2	
		Understanding the concept of Crack Tip Plasticity	1						2	
		Understanding the concept Elastic Plastic Fracture Mechanics (EPFM)		2					2	

		Understanding the concept of Fatigue Crack Growth and practical problems of fracture mechanics		2					2	
11 CE 643	Green Buildings	Understanding the concept of green buildings and practices	1							1
		Understanding the Green Building Opportunities And Benefits and Green Building Design	1							1
		Understanding the concept of optimal air-conditioning	1							1
		Understanding the concept of Material Conservation and Indoor Environment Quality And Occupational Health:	1							1
11 CE 551	Seminar							2	2	
11 IE 6050	Dissertation							2	2	

K L University

Department of ECE

Academic Year 2013

M.Tech Program Communication Systems and Radar

Mapping of ECE Department M.Tech (CR) Mission Statement with POs, PSOs and PEOs

Program Outcomes

Mission statement of K L University

Vision

To be a globally renowned university.

Mission

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

Vision and Mission statement of ECE department

VISION

- To evolve into a globally recognized department in the frontier areas of Electronics & Communication Engineering (ECE).

MISSION

M1- To produce graduates having professional excellence.

M2- To carry out quality research having social & industrial relevance.

M3- To provide technical support to budding entrepreneurs and existing industries.

PROGRAM EDUCATIONAL OBJECTIVES (PEOS):

- **PEO1:** Apply concepts of Statistics, Linear Algebra and Residue Calculus in Communication, Signal processing and Electromagnetic domain.
- **PEO2:** Solve issues in real world communication sectors, and develop feasible and viable communication systems.
- **PEO3:** Inculcate effective communication skills, practice effective team work, professional ethics and pursue research.

Programe Outcomes

PO1	a	The courses expose students to a deep understanding of Channel Encoding and Decoding, Modulation and Demodulation, Radio Frequency Conversion, Channel Transmission, and performance extraction.
PO2	b	The course involves understanding of the physical issues in communications and its abstraction to mathematical models, followed by engineering approximation leading to a viable algorithm
PO3	c	The course involves mathematical modeling of communication events including noise, devices and systems that are different across various channels and hence is intensively problem oriented.
PO4	d	The approach in this course has been to provide a strong exposure to fundamentals with full mathematical rigor in Signal Processing, Communications and Electromagnetic followed by an exposure to specific courses in state of art in wireless, wire line and optical communications. This provides a strong background to engage in developments in these communication systems.
PO5	e	The student is exposed to Numerical and Algorithmic procedures in the theoretical courses with a strong lab component using Matlab environment, Embedded Environment and Electromagnetic Flow solver tools like HFSS and FEKO.
PO6	f	As a part of the mini project, major project or internship the student is exposed to interfacing for communications with real world sensors, transmission of speech and complex images from cameras all of which require multidisciplinary work.

PO7	g	Dev As a part of progress reports on mini and major projects the student is expected to develop his skills in written and oral presentation of the work that he has accomplished. Develop professional and ethical attitude and become socially responsible citizens.
PO8	h	Exposure to prerequisite math's and a mathematically rigorous approach to communication theory will provide him with all the necessary background to pursue a career in any field of communications going forward in his career.
PO9	i	In the individual lab assignments, mini project and major project tasks the student is exposed to thought provoking issues in communication system practice that need association of theoretical learning with real issues in a communication environment.

Mapping of Mission statements with program educational objectives

	M1	M2	M3
PEO1			✓
PEO2		✓	✓
PEO3	✓	✓	

Mapping of PEOs with Pos and PSOs

	PEO1	PEO2	PEO3
PO1	✓	✓	
PO2	✓	✓	
PO3	✓	✓	
PO4	✓		✓
PO5	✓		
PO6		✓	✓
PO7			✓
PO8	✓		
PO9	✓	✓	

MTech COMMUNICATION & RADAR [A.Y - 2013 - 2014]

S. NO	COURSE CODE	COURSE NAME	CO No	CO	1	2	3	4	5	6	7	8	9
1	13EC501	Modern Digital Communications	1	Understand different modern digital modulation techniques and probability of error statistics.	1								
			2	Analyze the performance of baseband and pass band data transmission in terms of signaling schemes.	2								
			3	Understand the concepts of block and convolution codes with respect to transfer functions and decoding operations.	1								
			4	Analyze the spread spectrum signals and signal analysis for different digital communication technologies.				2					
			5	Interpret different digital communication modules with respect to signal analysis in application orientation.				3					
2	13EC503	Microwave and Millimetric wave circuits	1	Classify different microwave circuits based on applications.		1							
			2	Estimate the importance of transformers and resonators in microwave circuit design.			2						
			3	Design of microwave filters and periodic structures.				3					
			4	Understand the feeding principles and excitation techniques in waveguide design.				1					
			5	Construct millimeter wave circuits using electromagnetic tools.					3				

3	**13EC502**	**Radiating Systems**	1	Understand the basic antenna parameters of different antennas to estimate the radiation characteristics of different current distributions.	1							
			2	Analyzing the different distributions of an antenna and Apply the concept of radiation to reflector antenna.		2						
			3	Analyze the characteristics of linear antennas, antenna synthesis techniques and micro strip antennas.	1							
			4	Understand the different types of strip antennas and analyzing the radiation parameters using antenna measurements.	1							
4	**13 EC 50**	**MOS CIRCUIT DESIGN**	**1**	Understand the basics concepts of digital system design, modeling techniques in Verilog HDL.					1			
			2	Design ofvariousCombinational&SequentialLogicrealizationsusingVerilog HDL and design flow	3				3			
			3	Characteristics of inverter and calculation of different delays	1							
			4	Design of different combinational and sequential circuits					3			
			5	CreateandAnalysisofdigitalmodulesthroughprojectoriented approach						3		
5	**13EC520**	**Image and Video Processing**	1	Understand the fundamentals of Image processing and Image Transformations	1							
			2	To know and perform the different Image processing techniques to enhance and filter the image			2					
			3	Demonstrates the various image compression models			2					

			4	Understand the basic concepts of Video processing and Image formation models	1								
			5	To know and implement various 2D motion estimation algorithms				3					
6	13 EC 59	VLSI Signal Processing	1	Understand VLSI design methodology for signal processing systems.	1								
			2	Understand scaling and round-off noise issues and their impact on performance	1								
			3	Algorithm transform techniques for the inner receiver: pipelining, parallel processing, retiming, folding, unfolding, look-ahead, relaxed look-ahead, algebraic and decorrelating transforms			3						
			4	Algorithms and architectures for the outer receiver: Reed-Solomon decoders, Viterbi decoders and turbo and LDPC decoders			3						
7	13 EC 21	Advanced Digital Signal Processing	1	Comprehend the DFTs and FFTs.		2							
			2	Design and Analyze the digital filters.				3					
			3	Acquire the basics of multi rate digital signal processing.	1								
			4	Analyze the power spectrum estimation		2							
			5	Comprehend the Finite word length effects in Fixed point DSP Systems			1						
8	13EC522	Radar Signal Processing	1	Interpret the angle of arrial estimation in the presence of multipath with different methods.	3								
			2	Analyze the time domain and frequency domain analysis of sea clutter.	2								
			3	Understand the dynamics of sea clutter in the case of stationary and non-stationary and influence of long waves		1							

			4	Relate two types of strategies for target detection in sea clutter with procedures.			1						
9	**13EC504**	**Wireless Cellular Communications**	**1**	Understand the basic elements of cellular mobile radio system design.	1								
			2	Identify different applications of speech coding in wireless systems.		1							
			3	Understand the radio propagation and cellular engineering concepts	1								
			4	Identify digital modulation and demodulation principles and architectures, interference in wireless communication systems.	1								
10	**13EC566**	**CMOS RF Circuit Design**	**1**	Understand Fundamental Issues related to RF circuit design	1								
			2	Analyze different Analog and Digital Modulation Schemes	2								
			3	Examine Heterodyne Receivers, Direct IF and Subsampled Receivers		2							
			4	Analyze BJT and MOSFET behavior at RF Frequencies		2							
			5	Modeling and Design of RF circuits at different frequencies.				3					
11	**13EC506**	**Estimation**	**1**	Classify different criteria associated to detection		1							

		and Detection Theory		theory at receiver.									
			2	Understand the concepts of integration of optimum receiver and matched filter receiver.			1						
			3	Analyze the maximum likelihood estimation methods.		2							
			4	Understand the concepts of estimation in the presence of Gaussian noise and prediction with Kalman filters.			1						
12	**13EC505**	**RF and Microwave System Design**	**1**	Understand the importance of RF & Microwave System design with passive components.	1								
			2	Understand Smith chart concept for analyzing S, Y, Z parameters.		1							
			3	Analyze S-parameters with conversions and modeling.		2							
			4	Design of RF- filters, amplifiers and oscillators.				3					

Professor incharge Head of the department

Department of Computer Science Engineering

M.Tech CNS R13 Batch

K L UNIVERSITY:

Vision statement of K L University

To be a globally renowned university.

Mission statement of K L University

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

Vision statement of CSE department

To be a department of International repute through continuous research, innovation and industry led curriculum.

Mission statement of CSE department

To Impart Quality Education with social consciousness and make them Globally Competent.

M1	Provide quality undergraduate and graduate education in both the theoretica computer science
M2	Train students to effectively apply this education to solve real-world problems
M3	Give students a competitive advantage in the ever-changing and challenging global work environment
M4	Conduct research to advance the state of the art in theoretical computer science and integrate results, innovations into other scientific disciplines

Programe Educattional Objectives

PEO1	I. Develop technologically competent computer professionals in today's IT centric scenario by training them in the contemporary software engineering principles and paradigms.
PEO2	II. Provide students a deep insight into various cutting edge technologies& tools and thereby creating diverse career opportunities.
PEO3	III. Improve analytical, logical and presentation skills of the students by applying evolving technologies of software engineering in developing practical solutions to complex problems in consonance with the legal and ethical responsibilities.
PEO4	IV. Provide the students with project engineering and management skills catering to the changing industry needs and constraints across the advancing domains of

	computing

PROGRAM OBJECTIVES

PO1	1. Apply the knowledge of computer engineering principles and paradigms in the design of system components and processes that meet the specific needs of the industry
PO2	2. Identify, analyze and formulate solutions to complex engineering problems using innovative and emerging technologies.
PO3	3. Effectively communicate technical information in speech, presentation and documentation.
PO4	4. Extract information relevant to novel problems and apply appropriate research methodology to develop scientific knowledge.
PO5	5. Self-learn and pursue higher studies to upgrade qualifications and attain constructive growth in profession

PROGRAM SPECIFIC OBJECTIVES

PSO1	1. Make valuable contributions to design, development, and production in the practice of computer science and related engineering or application areas,

	particularly in software systems and algorithmic methods.
PSO2	2. Provide exposure of latest software tools and technologies in the area of engineering and technology.
PSO3	3. Publish a research paper on the findings of research conducted in the domain of specialization.

Mapping of Mission statements with program educational objectives

	M1	M2	M3	M4
PEO1	✓	✓		
PEO2	✓			✓
PEO3		✓	✓	✓
PEO4			✓	

Mapping of PEOs with Pos and PSOs

	PEO1	PEO2	PEO3	PEO4
PO1	✓	✓		
PO2	✓	✓		
PO3			✓	✓
PO4				✓
PO5	✓			✓
PSO1	✓			
PSO2			✓	
PSO3				✓

COURSE ARTICULATION MATRIX
FOR M.Tech CNS

for R13

Course Code	Course Title	Credits	CO NO	Description of the Course Outcome	student outcome(SO)					Program specific Outcomes		
					1	2	3	4	5	PSO1	PSO2	PSO3
11 CN 501	DATA STRUCTURES AND ALGORITHMS	5	CO1	apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.	**2**				**2**	3		
			CO2	analyze and compare linear data structures and analyze different searching and hashing techniques.	**2**				**2**	3		
			CO3	analyze and compare various non – linear data structures like Trees and Graphs.	**2**				**2**	3		
			CO4	analyze and compare various sorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a	**2**				**2**	3		

				particular context.								
			CO5	understand and execute lab experiments and develop a small project along with his/her team members.	**2**				**2**	2		
11 CN 502	ADVANCED COMPUTER NETWORKS	4	CO1	Understand OSI and TCP/IP Models and basics of physical layer and their issues	**2**				**2**	2		
			CO2	Demonstrate Data Link layer issues and medium access control sub layers concepts	**2**				**2**	2		
			CO3	Analyze and implement the algorithms of network and transport layers and concerned services	**2**				**2**	2		
			CO4	Evaluate and execute the concepts of TCP ,UDP and the application layer conceptions	**2**				**2**	2		
			CO5	design the architecure of TCP/UDP	**2**			**2**	**2**	2		
11 CN	TCP / IP PROTOCOLS	5	CO1	Understand OSI and TCP/IP Models and basics of physical layer and their		1	1			2		

503				issues								
			CO2	Demonstrate Data Link layer issues and medium access control sub layers concepts	1		2			2		
			CO3	Analyze and implement the algorithms of network and transport layers and concerned services			2		1	2		
			CO4	Evaluate and execute the concepts of TCP ,UDP and the application layer conceptions	1					2		
			CO5	Demonstrate the basic concepts of protocols and their design including client/server models, connection oriented and connection-less models						2		
11 CN 504	ADHOC NETWORKS	4	CO1	To know the constraints of the wireless physical layer that affect the design and performance of ad hoc and sensor	**1**				**1**	2		
			CO2	networks, protocols, and applications;	**2**				**2**	2		
			CO3	To explain various security threats to ad hoc networks and describe	**2**				**2**	2		

				proposed solutions								
			CO4	demonstrate the testing strategies	**1**				**1**	2		
			CO5	To understand the energy issues in sensor networks and how they can be addressed using scheduling, media access					**3**	2		
11 CNE 12	WIRELESS COMMUNICATION & NETWORKS	3	CO1	To provide an overview of Wireless Communication networks area and its applications in communication engineering.	**1**						2	
			CO2	To appreciate the contribution of Wireless Communication networks to overall technological growth.					**2**		2	
			CO3	To understand the various terminology, principles, devices, schemes, concepts, algorithms and different methodologies used in Wireless Communication Networks.					**2**		2	
			CO4	To motivate the students to pursue research in the area of wireless communication.					**3**		2	
11 CNE	CLOUD COMPUTING	3	CO1	Identify the appropriate cloud	1				2		2	

21				services for a given application								
			CO2	Analyze Cloud infrastructure including Google Cloud and Amazon Cloud.	1				2		2	
			CO3	Analyze authentication, confidentiality and privacy issues in Cloud computing environment.	1				2		2	
			CO4	Determine financial and technological implications for selecting cloud computing platforms	1				2		2	
11CN506	CRYPTOGRAPHY AND NETWORK SECURITY	4	CO1	The student will learn importance of data communications and the Internet in supporting business communications and daily activities.		**2**				3		
			CO2	The student Explain how communication works in data networks and the Internet.			2			3		
			CO3	The student Recognize the different internetworking devices and their functions.		2				3		
			CO4	The student Explain the role of protocols in networking						3		

			CO5	Students Analyze the services and features of the various layers of data networks.	1					3		
11CN507	NETWORK PROGRAMMING	4	CO1	analyse the requirements of a networked programming environment and identify the issues to be solved;						3		
			CO2	create conceptual solutions to those issues and implement a programming solution;		1				3		
			CO3	understand the key protocols that support the Internet;					2	3		
			CO4	apply several common programming interfaces to network communication;	**1**					3		
11CN508	NETWORK ROUTING	4	CO1	understand the use of TCP/UDP Sockets	1				2	2		
			CO2	illustrate and examine modern cryptographic and hash algorithms		1		2		2		
			CO3	demonstrate and study MAC and digital signature algorithms			1	2		2		
			CO4	demonstrate and study key			1	2	2	2		

				management distributions								
11CN509	SECURE SYSTEMS DEVELOPMENT WITH UML	5	CO1	Understand the principles and methodologies for designing and implementing secure systems, and establishing software assurance					**2**	2		
			CO2	Understand and analyze code for vulnerabilities and learn secure programming practices	1					2		
			CO3	Use of tools for code analysis and security property verifications (labs)	1					2		
			CO4	Apply secure design principles to build a real system (projects)	**1**					2		
			CO5	Supply Chain Security, Life-Cycle Security, Security Risk Analysi					**2**	2		
11CNE41	MOBILE COMPUTING	3	CO1	Define Mobile Computing and look at current trends					**2**		2	
			CO2	Distinguish between types of Mobility	1						2	
			CO3	Examine Theory Research in Mobility	1						2	
			CO4	Examine Systems Research in Mobility	**1**						2	

11CNE32	NETWORK MANAGEMENT	3	CO1	Understand general concepts and architecture behind standa rds based network manag ement					**2**		2	
			CO2	Understand concepts and terminology associated with SNMP and TMN	1						2	
			CO3	Appreciate network management as a typical distributed application	1						2	
			CO4	Understand Advanced Information Processing Techniques	**1**						2	
11CN505	SEMINAR	2						**2**	**2**			2
11CN510	TERM PAPER	2						**2**	**2**			2
14TM602	INTERNSHIP	18						**2**	**2**			3
11 CS 601	THESIS/PROJECT	18						**2**	**2**			3
		87			**45**	**7**	**9**	**16**	**67**			

M.Tech CSE R13 Batch

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PROGRAM OBJECTIVES

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PO3	3. Effectively communicate technical information in speech, presentation and documentation.
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Mapping of Mission statements with program educational objectives

	M1	M2	M3	M4
PEO1	✓	✓		
PEO2	✓			✓
PEO3		✓	✓	✓
PEO4			✓	

Mapping of PEOs with Pos and PSOs

	PEO1	PEO2	PEO3	PEO4
PO1	✓	✓		
PO2	✓	✓		
PO3			✓	✓
PO4				✓
PO5	✓			✓
PSO1	✓			
PSO2			✓	
PSO3				✓

Department of Computer Science & Engineering

COURSE ARTICULATION MATRIX- M.Tech(CSE)

for R13

SNO	Course Code	Course Title	Credits	CO NO	Description of the Course Outcome	Program Outcome (PO)					Pr o
						1	2	3	4	5	1
1	11CS501	DATA STRUCTURES AND ALOGORITHMS	5	CO1	apply measures of efficiency to algorithms and Compare various linear data structures like Stack ADT, Queue ADT, Linked lists.	**1**	**2**				
				CO2	analyze and compare linear data structures and analyze different searching and hashing techniques.	**1**	**2**				
				CO3	analyze and compare various non – linear data structures like Trees and Graphs.	**1**	**2**				
				CO4	analyze and compare various sorting algorithms, to select from a range of possible options, to provide justification for that selection, and to implement the algorithm in a particular context.	**2**	**2**				
				CO5	understand and execute lab experiments and develop a small project along with his/her team members.	**1**	**1**				

2	11CS502	COMPUTER ORGANIZATION	4	CO1	Student will be able to Understand the Overview of von Neumann architecture and Pipelining	**1**	**2**				
				CO2	Student will be able to Demonstrate Hierarchical Memory Technology	**1**	**2**				
				CO3	Student will be able to Explain the Instruction level parallelism	**1**	**2**				
				CO4	Student will be able to Analyze the Multiprocessor Architecture	**2**	**2**				
				CO5	Student will be able to Analyze the Multiprocessor Architecture	**1**	**1**				
3	11CS503	OPERATING SYSTEMS	4	CO1	Understand the basic concepts of operating system, OS structure and process concepts.	**1**	**2**				
				CO2	Apply the concepts Process Scheduling algorithms and Process Synchronization Problems.	**1**	**2**				
				CO3	Solve the concept of the Deadlock, Memory Management and Virtual Memory Concepts.	**1**	**2**				
				CO4	Demonstrate file system interface, structure, file allocation methods, free space management and threads.	**2**	**2**				

				CO5	Create and develop a project along with his/her team members.	**1**	**1**				
4	11CS504	OBJECT ORIENTED PROGRAMMING	5	CO1	The student will be able to understand Basic Concepts of OOP, apply the concepts of classes and objects through Java Language.	**1**	**2**				
				CO2	The student will be able to apply the concepts of constructors, Overloading, parameter passing, access control, Inheritance.	**1**	**2**				
				CO3	The student will be able to apply Packages, Interfaces, Exception Handling.	**1**	**2**				
				CO4	The student will be able to apply I/O Streams and understand Basic Concepts of Multi – Threading	**2**	**2**				
				CO5	Students will be able to develop programs and projects in java.	**1**	**1**				
5	11CS506	COMPUTER NETWORKS	5	CO1	Understand OSI and TCP/IP Models and basics of physical layer and their issues	**1**	**2**				
				CO2	Demonstrate Data Link layer issues and medium access control sub layers concepts	**1**	**2**				
				CO3	Analyze and implement the algorithms of network and transport layers and	**1**	**2**				

					concerned services						
				CO4	Evaluate and execute the concepts of TCP ,UDP and the application layer conceptions	**2**	**2**				
				CO5	Demonstrate the basic concepts of protocols and their design including client/server models, connection oriented and connection-less models	**1**	**1**				
6	11CS507	SOFTWARE ENGINEERING	3	CO1	illustrate different phases involved in the software development	**1**	**2**				
				CO2	explain the concepts of system modeling	**1**	**2**				
				CO3	design the architecure UI	**1**	**2**	□			
				CO4	demonstrate the testing strategies	**2**	**2**	□			
7	11CS508	DATA BASE MANAGEMENT SYSTEMS	5	CO1	Understand the fundamentals of database management systems.	**1**	**2**				
				CO2	Construct database tables and apply SQL	**1**	**2**				
				CO3	Analyze various normalization techniques and develop procedures and functions in PL/SQL	**1**	**2**				
				CO4	Examine the various elements of Database Management and transaction processing.	**2**	**2**				
8	11CS509	EMBEDDED SYSTEMS	4	CO1	Introduction of the real time systems.	□	**1**				
				CO2	Computing required for the real time embedded	□	**1**				

					systems						
				CO3	Communication required for the real time embedded systems.	**1**					
				CO4	Present an overview of the realtime embedded systems in practice.	1					
10	11CSE12	MOBILE COMPUTING	3	CO1	Define Mobile Computing and look at current trends	1	1				
				CO2	Distinguish between types of Mobility		2				
				CO3	Examine Theory Research in Mobility	1					
				CO4	Examine Systems Research in Mobility		**2**				
13	11CSE21	ENTERPRISE PROGRAMMING	3	CO1	Learn the basic concepts of ObjectOrientation and how they are handled in Java	**2**					
				CO2	Understand Exceptions. How and when they should be handled		1				
				CO3	Learn how to use Servlet and JSP and XML with JSP		1				
				CO4	A presentation of Enterprise JavaBeans and how to use it	2					
18	11CSE32	CLOUD COMPUTING	3	CO1	Understand Enterprise cloud computing paradigm.	**1**					
				CO2	Evaluate the data security issues in clouds.	**2**					
				CO3	Understand PaaS cloud Computing Envinorments.	**1**					

				CO4	Analyze the performance of High performance computer on clouds.		**1**				
21	11CSE41	SEMANTIC WEB	3	CO1	understand the rationale behind Semantic Web.		**1**				
				CO2	model ontologies using Resource Description Framework (RDF)	**1**					
				CO3	design RDF Schemas for ontologies.	1					
				CO4	model and design ontologies using Web Ontology Language (OWL).	1	1				
25	11CS505	Seminar	2					**2**	**2**	2	
26	11CS605	Term Paper	2					**2**	**2**	**2**	
27	14TM602	Internship	18					**2**	**2**	**2**	
27	11CS601	Major Project	18					**2**	**2**	**2**	
TOTALS :			87			55	**76**	**11**	**12**	13	8

DEPARTMENT OF ELECTRONICS AND COMPUTER ENGINEERING

M.TECH (EMBEDDED SYSTEMS)
2013-2014

VISION AND MISSION STATEMENTS

UNIVERSITY

Vision

To be a globally renowned university.

Mission

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

DEPARTMENT

VISION

To promote innovation centric education and perform cutting edge research in interdisciplinary and multidisciplinary areas**.**

MISSION

To impart **value-based, state-of-art education** and motivate the students to become **socially committed professionals** for **overall development** of students

M1: Impart Value –Based Education

M2: Impart State of the art –education

M3: Motivate Students to become Socially Committed Professionals

M4: Overall Development of Students

PROGRAM EDUCATIONAL OBJECTIVES (PEOS) :

M. Tech. in Embedded Systems Program, graduates will be able to

PEO1: To mould the students to become effective global engineering students in the competitive environment of modern society.

PEO2: To develop communication, analytical, decision-making, motivational, leadership, problem solving and human relations skills of the students.

PEO3: To pursue lifelong learning as a means of enhancing knowledge and skills necessary to contribute to the betterment of profession.

PEO'S AND MISSION STATEMENT MAPPING

	M1	M2	M3	M4
PEO1		√		√
PEO2	√	√	√	√
PEO3	√		√	√

PROGRAM OUTCOMES(PO's)

M. Tech. in Embedded Systems Program, Graduates will be able to:

PO1: To demonstrate the skills to meet the current and future industrial challenges in the field of embedded systems engineering.

PO2: Able to create, develop, apply, and disseminate knowledge within the embedded systems development environment.

PO3: Ability to communicate effectively and professionally.

PO4: Develop professional and ethical attitude and become socially responsible citizens.

PO5: Ability to carry out cutting edge research in the emerging areas of Embedded Systems.

PO6: Demonstrate their role as engineers or entrepreneurs and contribute to the society.

MAPPING OF PEO's WITH PROGRAM OUTCOMES (PO'S)

	PEO1	PEO2	PEO3
PO1	√		√
PO2	√	√	
PO3	√		
PO4		√	
PO5	√		√
PO6	√	√	

COURSE VS POS & PSO'S MAPPING

Course Code	Course Title	L-T-P	CREDITS	CO		Program Outcomes(POs)					
						PO1	PO2	PO3	PO4	PO5	PO6
11-EM 501	Microcontrollers for Embedded System Design.	3-0-2	4	CO1	Understanding the fundamentals of Embedded Systems and its hardware and software architecture.	1					
				CO2	Demonstrate the working principle of 8051 microcontrollers and Processor Architecture & Interfacing		1				
				CO3	Analyze PIC Microcontroller Hardware with its Architecture & Interfacing	2				2	
				CO4	Analyze the Device Drivers , Interrupt service Mechanism and Devices & Communication Buses for Devices Network.		2				2
12-EM 502	Real Time Concepts for Embedded Systems	3-2-0	4	CO1	Undeerstand the current trends for Embedded Systems Design. Hard versus soft Real- Time Systems,A Reference Model of Real – Time Systems: Processors and Resources, Temporal Parameters of Real Time Workload, Periodic Task Model, Precedence Constraints and Data Dependency etc	1					
				CO2	Understand and apply Challenges in validating timing constraints in priority –driven systems Off-line versus On-line Scheduling		1				
				CO3	Analyze Priority-Driven Scheduling of Periodic Tasks, aperiodic tasks, and sporadic tasks with different scheduling mechanisms	2					2
				CO4	Understand Real-Time Operating Systems Other Basic Operating System					1	

					Functions						
13-EM 503	VLSI Technology & Design	3-0-2	4	CO1	Understand basic concepts of MOSFET, and study the second order effects in MOS technology concepts.	1					
				CO2	Understand various forms of CMOS devices, steps involved in CMOS IC fabrication and also the rules to draw stick & layout of CMOS circuits		1				
				CO3	Apply MOS device concepts for generating transistor level diagrams for digital circuits	2				2	
				CO4	Analyze CMOS circuits in terms of area, speed and power dissipation by applying the techniques like transistor sizing & design rules.						2
				CO5	Evaluate the design parameters (Area, Speed & Power) & driving capacity of CMOS circuits like Multiplexer, Latch e.t.c.	3					3
12-EM 504	Wireless Communications & Networks	3-2-0	4	CO1	Understand Mobile and Wireless Landscape,Wireless LAN and IEEE 802.11	1					
				CO2	Discuss Global System for Mobile Communications (GSM) and Medium Access Control (MAC)		1				
				CO3	Describe Mobile IP and Mobile Ad hoc Networks (MANETs)					1	
				CO4	Understand Mobile Transport Layer: Traditional TCP, Indirect TCP, Snooping TCP and Mobile TCP.						1
11-EM 601	Advanced Embedded Processor Architectures	3-2-0	4	CO1	Understand 3 and 5 stage pipelines of ARM	1					
				CO2	Apply instructions set of ARM 7 processor using assembly language		2				
				CO3	Understand the AMBA bus architecture	1				1	
				CO4	Understand different advanced ARM cores and analyze their use in SOC applications						1

13-EM 602	Digital Signal Processors and Architectures	3-2-0	4	CO1	At the end of the course the student will get familiarised with various DSP based Embedded System Applications. Understands the implementation aspects of Computational accuracy of DSP based algorithms	1					
				CO2	Understand the architectural features of programmable DSP devices. Student will be familiarised with development process applications based on DSK5416 development board and various development tools used.		1				
				CO3	To familiarize with Texas Instruments' TMS320C54XX family of fixed-point DSP Processors their architectures in-terms of addressing modes, Programming On-Chip Peripherals', Interrupts and Pipeline operations. Student will be getting familiarised with applications development process based on DSK5416 development board and various software development tools used.	1					
				CO4	Student will demonstrate the ability to implement various DSP algorithms used in different Embedded Systems based on TI's TMS320C54XX family of fixed-point DSP Processors					1	
				CO5	Student will demonstrate the ability to implement various DSP based Embedded Systems by interfacing DSPs with Memory, I/O with the help of integration concepts like INTERRUPTS, DMA and CODECs with DSP to use A/D and D/A converters for serial I/O.						1
11-EM 603	Hardware Software Co – Design			CO1	To remember and understand the basic concepts of model ,	1					

					Architecture and programming Language						
				CO2	To remember and understand the Hardware software synthesis algorithms and software partitioning distributed system co-synthesis		1				
				CO3	To understand Architecture Specialization techniques, Architecture for control dominated systems					1	
				CO4	Analyze and apply the techniques of Modern embedded architectures and compilation technologies	2				2	
				CO5	Analyze concurrency coordinating, concurrent computations and verification tools.		2				2
13-EM 604	Linux System Concepts	3-0-2	4	CO1	Apply various various GNU development tools for compiling, debugging and creating libraries.	2					2
				CO2	Understand the concepts related to Linux kernel Configuration and kernel modules		1				
				CO3	Understand various concepts related to User and Kernel Space communication, Interrupt Handling and Kernel Debugging.					1	
				CO4	Analyze various types of device drivers that can be build into the kernel .		2				
				C05	Create Networking communication between client and server using SOCKET API	3					3
13-EM - E30	CPLD & FPGA Architectures and Applications	3-0-0	3	CO1	Understand the architecture and features of ROM,PLA,PAL and CPLD	1					
				CO2	Understand the architecture and features of FPGA.		1				
				CO3	Understand XILINX FPGAs and Design various combinational & sequential logicrealization using XILINX					1	

					FPGAS						
				CO4	Analyze the technologies of Actel FPGAs	2					2
				CO5	Analyze different Design Applications		2			2	
11-EM-E32	Embedded Networking	3-0-0	3	CO1	Understanding the concepts of Embedded Networking Communication Standard protocols: RS 232, RS 485, SPI, I2C bus protocols.	1					
				CO2	Analyze the US B& CAN based synchronization Techniques	2				2	
				CO3	Applying Ethernet communication protocols for Embedded Systems						2
				CO4	Apply different wireless sensor networks used in embedded systems.		2				
12-EM-E41	System On Chip Architecture	3-0-0	3	CO1	Understand SoB, SoC & SoP for electronic product in terms of size, cost, performance and reliability.	1					
				CO2	Analyze design flow in SoC Environment and verification of electronic circuits		2				2
				CO3	Understand embedded memories used for SoC Enviormnment	1					1
				CO4	Analyze the bus architectures of NOCs and routing.	2				2	
				CO5	Understand the techniques for designing MPSoCs and its performance.	1					1
12-EM-E44	Real Time Operating Systems	3-0-0	3	CO1	Understanding the concepts of Embedded Networking Communication Standard protocols: RS 232, RS 485, SPI, I2C bus protocols.	1					
				CO2	Analyze the US B& CAN based synchronization Techniques		2				
				CO3	Applying Ethernet communication protocols for Embedded Systems					2	

				CO4	Apply different wireless sensor networks used in embedded systems.	2					2

M.Tech Embedded Systems
Course structure for the A.Y. 2013-2015

S No	Course Code	Semester: - 1	L	T	P	Cr
1	11-EM501	Microcontrollers for Embedded System Design.	**3**	**1**	**2**	**5**
2	12-EM502	Real Time Concepts for Embedded Systems	**3**	**1**	**0**	**4**
3	13-EM503	VLSI Technology & Design	**3**	**1**	**2**	**5**
4	12-EM504	Wireless Communications & Networks	**3**	**1**	**0**	**4**
5		Elective – 1 –GROUP-A	**3**	**0**	**0**	**3**
6		Elective – 2 –GROUP-B	**3**	**0**	**0**	**3**
7	12EM505	Seminar	**0**	**0**	**4**	**2**
		Total Credits				**26**
S No	**Course Code**	**Semester: - 2**	**L**	**T**	**P**	**Cr**
1	11-EM601	Advanced Embedded Processor Architectures	**3**	**1**	**2**	**5**
2	13-EM602	Digital Signal Processors and Architectures	**3**	**1**	**0**	**4**
3	11-EM603	Hardware Software Co –Design	**3**	**1**	**0**	**4**
4	13-EM604	Linux System Concepts	**3**	**1**	**2**	**5**
5		Elective – 3 --GROUP-A	**3**	**0**	**0**	**3**
6		Elective -4 --GROUP-B	**3**	**0**	**0**	**3**
7	11TP501	Term Paper	**0**	**0**	**4**	**2**
		Total Credits				**26**

S.No.	Course Code		Credits
		SEMESTER-3	
1	14TM602	Internship	18
		SEMESTER -4	
2	EMCT01	Thesis	18
Total Credits			**88**

COURSE CODE	GROUP-A
13-EM-E30	CPLD & FPGA Architectures and Applications
11-EM-E31	Network Security & Cryptography
11-EM-E32	Advanced Digital signal processing
11-EM-E33	Ad-hoc & Wireless Sensor Networks
11-EM-E34	Robotics
11-EM-E35	System Modeling and Simulation
	GROUP-B
11-EM-E40	Embedded Linux
12-EM-E41	System On Chip Architecture
11-EM-E42	Advanced Computer Networks

11-EM-E43	Image and Video Processing
12-EM-E44	Real Time Operating Systems
12-EM-E45	Object Oriented Analysis and Design

K L UNIVERSITY
DEPARTMENT OF ELECTRICAL ENGINEERING
PROGRAM DEVELOPMENT DOCUMENT
M.Tech in Power Electronics Specialization
2013

Vision of the University

To be a globally renowned university.

Mission of the university:

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

VISION of the Department

To Produce globally renowned leader in education, extension activities and Carrying out research and technology development in frontier areas of electronics and electrical engineering and allied fields

MISSION of the Department

To produce quality electrical and electronics engineers having strong theoretical foundation, innovative, good design experience , exposure to research and development and responsible for social needs.

Program Educational Objectives

Programme Educational Objectives:

1.To produce well trained post graduates in the domain of power electronics and electrical drives, and ensure that at least 50 % of those are employable in the diversified sectors of industry, public sector or multinational corporations.
2. To produce some of these (15-20 %) post graduates will pursue Ph.D.
3. To produce some of these will demonstrate the academic leadership in engineering institutions and serve the education.
4. To inculcate research attitude and lifelong learning among postgraduates

Program Outcome's

a. apply the knowledge of science and mathematics in designing, analyzing and using the power converters and drives for various applications and problem solving
b. design the modern electric machines, drives, power converters, and control circuits for specific application
c. use modern tools, professional software platforms, embedded systems for the diversified applications
d. Function as a member of a multidisciplinary team and correlate the domain knowledge with global problems.
e. sense and demonstrates the communication at different levels effectively
f. explore ideas for inculcating research skills and appreciate, critical and independent thinking and engage in lifelong learning

MAPPING OF PEOs with MISSION OF THE DEPARTMENT:

S.No.	Program Educational Objectives(PEOs)	M1 Training the leaders of tomorrow	M2 Training the innovators of tomorrow	M3 Training the outstanding career professionals of tomorrow	M4 Conducting fundamental research
1	To produce well trained post graduates in the domain of power electronics drives, and ensure that at least 50 % of those are employable in the diversified sectors of industry, public sector or multinational corporations.	**√**	**√**	**√**	

2	To produce some of these (15-20 %) post graduates will pursue Ph.D.		**√**	**√**	**√**
3	. To produce some of these will demonstrate the academic leadership in engineering institutions and serve the education.	**√**	**√**	**√**	
4	To inculcate research attitude and lifelong learning among postgraduates		**√**	**√**	**√**

MAPPING OF POs/PSOs with PEOs:

Mapping of POs to PEOs					
S.No.	**Program Objectives(POs)**	**Program Educational Objectives(PEOs)**			
		1	**2**	**3**	**4**
a	apply the knowledge of science and mathematics in designing, analyzing and using the power converters and drives for various applications and problem solving	**√**	**√**	**√**	**√**
b	. design the modern electric machines, drives, power converters, and control circuits for specific application	**√**	**√**		**√**
c	use modern tools, professional software platforms, embedded systems for the diversified applications	**√**	**√**		**√**
d	Function as a member of a multidisciplinary team and correlate the domain knowledge with global problems.	**√**	**√**	**√**	**√**
e	sense and demonstrates the communication at different levels effectively	**√**		**√**	**√**
f	.explore ideas for inculcating research skills and appreciate, critical and independent thinking and engage in lifelong learning	**√**	**√**		**√**

Course Code	Course Title	S NO	CO NO	Description of the Course Outcome	a	b	c	d	e	f
11EE511	Power Electronic Circuits - I		CO1	Select an appropriate power semiconductor device and design a power converter for the required application		√				
			CO2	Determine the power circuit configuration needed to fulfill the required power conversion with applicable constraints		√				
			CO3	Design the control circuit and the power circuit for a given power converter	√	√				
			CO4	Determine the drive circuit requirements in terms of electrical isolation and the requirement of bipolar drive and ease of control	√	√				
			CO5	Recognize possible modes of failure of a circuit - troubleshoot and repair	√	√				√

11EE512	Electrical Machine Modeling & Analysis		CO1	Design and simulate the modeling concepts of 3-phase synchronous machine and 3-phase Induction machine, Kron"s primitive machine equations	√	√				
			CO2	Analyze the mathematical model of separately excited D.C Motor, D.C Series & shunt motor and its steady state, transient state analysis	√					
			CO3	Transform from 3 phase to 2 phase parks transformation of induction machine signal flow graph of the induction machine	√					
			CO4	Design the modeling of 1-phase and poly phase Induction machine, cross field theory, modeling of synchronous machine	√	√				
11EE503	Optimization Techniques		CO1	Apply numerical or iterative techniques in power systems for optimal power flow solutions	√					
			CO2	Optimize the parameters in control systems for desired steady state or transient response	√					
			CO3	Optimize the cost function in deciding economic factors of power systems	√	√				
			CO4	Design of electrical systems optimally using suitable techniques like univariate method, steepest descent method etc		√	√	√		
11EE504	Modern Control Theory		CO1	this course introduces Z Transforms and analysis of discrete data systems using Z Transforms	√					√
			CO2	in case of multiple input and multiple output systems, this course helps to deal with digital control systems	√	√				√
			CO3	the Non – Linear systems which will come across in most of practical systems, this course deals about Non – Linearity's	√	√				√
			CO4	since stability is most important for everyu systems to give it satisfactory performance, this topic also helps	√					√

11EE540	Special Machines		CO1	Understand the Modelling of 3-phase induction motor in various reference frames and control of induction motor		√		√		
			CO2	Understand the working and control of Brushless dc motor and Switched reluctance motor	√			√		
			CO3	Understand the working and control of PM synchronous machine and Stepper motor	√			√		
			CO4	Understand the working and control of Stepper motor	√			√		
11EE534	Non Conventional Energy Resources		CO1	Introduction of types of non conventional devices	√					√
			CO2	Analysing and design concepts of solar energy systems		√	√		√	
			CO3	Analysing and design concepts of wind energy systems		√	√		√	
			CO4	Case study on different energy systems						√
11EE513	Power Electronic Circuits – II		CO1	Model existing and modified power converters under small signal and steady state condition		√				
			CO2	Develop power converters with better performance for challenging applications		√				
			CO3	Analyze and design power converters and feedback loops		√				
			CO4	Analyze power quality problems and suggest solutions		√				√
			CO5	Understand the reason for convergence problems occurring during simulation and to avoid them		√				√
11EE506	Micro Controllers & Embedded Systems		CO1	To know about ARM Processor Registers, Instruction pipeline, Interrupts and Architecture	√			√		
			CO2	To learn about Instructions, Addressing modes and conditional instructions	√			√		
			CO3	To learn about Cache architecture, Polices, Flushing,	√			√		
			CO4	To learn about MMU , page table translation and access	√			√		

				permission						
11EE514	Power Electronic Control of Drives		CO1	To study 1-φ & 3-φ controlled bridge rectifier with motor load on continuous and discontinuous modes of operation and effect of freewheeling diode on converter performance	√	√				
			CO2	To understand the operation of three phase naturally commutated bridge as a rectifier and inverter	√	√				
			CO3	To study the steady state analysis three phase converter controlled and chopper controlled DC Motor drives and design speed current controller	√	√				
			CO4	To know the closed loop operation and dynamic simulation of DC motor drive system with current Controller.	√	√				
11EE515	Intelligent Control of Electrical Drives		CO1	Apply the concept of about ANN and BNN models	√	√				
			CO2	Design the genetic algorithms using MATLAB				√		
			CO3	Emphasize the fuzzy logic system and fuzzy logic control electrical drives				√		
			CO4	Estimate the harmonic s in PWM control, space vector PWM and speed and flux estimation of induction motor		√				
11EE544	Electric Vehicles		CO1	Understand the vehicle mechanics and working of Internal combustion engines used for HEV	√			√		
			CO2	Analyze the battery and Electric Drive performance for HEV	√	√		√		
			CO3	Understand the control strategies for HEV		√		√		
			CO4	Working and matlab model of HEV		√	√	√		
11EE535	Flexible AC Transmission System		CO1	Need and importance of facts device and benfits over HVDC Systems	√					

			CO2	Analyzing FACTS devices for improving system stability		√	√			
			CO3	Analyzing the shunt facts devices		√	√			
			CO4	Analyzing combination of shunt and series facts devics like upfc and upqc		√	√			

K L UNIVERSITY
DEPARTMENT OF ELECTRICAL ENGINEERING
PROGRAM DEVELOPMENT DOCUMENT
M.Tech in POWER SYSTEM SPECALIZATION
2013

Vision of the University

To be a globally renowned university.

Mission of the university:

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

VISION of the Department

To Produce globally renowned leader in education, extension activities and Carrying out research and technology development in frontier areas of electronics and electrical engineering and allied fields

MISSION of the Department

To produce quality electrical and electronics engineers having strong theoretical foundation, innovative, good design experience , exposure to research and development and responsible for social needs.

Program Educational Objectives

1. To produce electrical power systems postgraduates, who are employable in public and private industries /institutes /organizations or pursue higher education.
2 .To prepare postgraduates who have the ability to identify and address Current and future problems in the domain of power systems, power
Electronics and electrical machines.
3. To inculcate research attitude and lifelong learning among postgraduates
4. To produce some of these will demonstrate the academic leadership in engineering institutions and serve the education.

Program Outcome's

a. Acquire in- depth knowledge in the domain of power systems and understanding of engineering principles for project management.
b.Ability to critically analyze various power system components, models and their operation.
c.Ability to apply fundamentals and concepts to analyze, formulate and solve complex problems of electrical power systems and its components.
d.Apply advanced concepts of electrical power engineering to analyze, design and develop electrical components, apparatus and systems to put forward scientific findings at national and international levels.
e.Ability to use advanced techniques, skills and modern scientific and engineering tools for professional practice.
f. Preparedness to lead a multidisciplinary scientific research team, communicate and lifelong learning effectively.

MAPPING OF PEOs with MISSION OF THE DEPARTMENT:

S.No.	Program Educational Objectives(PEOs)	M1 Training the leaders of tomorrow	M2 Training the innovators of	M3 Training the outstanding career professionals	Con fund res

			tomorrow	of tomorrow	
1	To produce electrical power systems postgraduates, who are employable in public and private industries /institutes /organizations or pursue higher education.		**√**	**√**	
2	To prepare postgraduates who have the ability to identify and address Current and future problems in the domain of power systems, power Electronics and electrical machines.		**√**	**√**	
3	To inculcate research attitude and lifelong learning among postgraduates and pursuing of Ph.D		**√**	**√**	
4	To produce some of these will demonstrate the academic leadership in engineering institutions and serve the education	**√**	**√**	**√**	

MAPPING OF POs/PSOs with PEOs:

Mapping of POs to PEOs		
S.No.	**Program Objectives(POs)**	**Program Educational Objectives(PEOs)**

		1	2	3	4
a	Acquire in- depth knowledge in the domain of power systems and understanding of engineering principles for project management.	√	√	√	
b	Ability to critically analyze various power system components, models and their operation	√	√	√	√
c	Ability to apply fundamentals and concepts to analyze, formulate and solve complex problems of electrical power systems and its components.	√	√	√	√
d	Apply advanced concepts of electrical power engineering to analyze, design and develop electrical components, apparatus and systems to put forward scientific findings at national and international levels	√	√	√	
e	Ability to use advanced techniques, skills and modern scientific and engineering tools for professional practice.		√	√	√
f	Preparedness to lead a multidisciplinary scientific research team, communicate and lifelong learning effectively	√		√	√

Course Code	Course Title	S NO	CO NO	Description of the Course Outcome	a	b	c	d	e	f
11EE501	Power System Analysis & Dynamics		CO1	To study the model of synchronous machines	√	√	√			
			CO2	To Analyse the stability studies of synchronous machines	√	√				
			CO3	To study the solution method of transient stability	√	√				
			CO4	To study the effect of different excitation systems	√	√				
			CO5	Programming and simulation on stability and excitation on		√			√	

				machiens						
11EE502	EHVAC & HVDC Transmission		CO1	Need of EHV transmission, Limitations , EHV transmission, Comparison of EHV-AC & HVDC transmission, Interconnected Network and Role of Interconnecting Transmission Lines	√			√		√
			CO2	HVDC system control, reactive power control, harmonics, multi terminal DC (MTDC) system, AC/DC system analysis, protection of terminal equipments.	√	√	√			
			CO3	Insulation Coordination-EHV-AC and HVDC, Insulation Coordination, Surge arrester protection in HVDC and EHV-AC Substation, Clearance for HVDC and EHV-AC.	√	√	√			
			CO4	mechanical design of towers, Tower design based on switching surges and lightning strokes.	√	√	√			
11EE503	Optimization Techniques		CO1	Apply numerical or iterative techniques in power systems for optimal power flow solutions	√					
			CO2	Optimize the parameters in control systems for desired steady state or transient response	√					
			CO3	Optimize the cost function in deciding economic factors of power systems	√	√				
			CO4	Design of electrical systems optimally using suitable techniques like univariate method, steepest descent method etc		√	√	√		
11EE504	Modern Control Theory		CO1	this course introduces Z Transforms and analysis of discrete data systems using Z Transforms	√					√
			CO2	in case of multiple input and multiple output systems, this course helps to deal with digital control systems	√	√				√
			CO3	the Non – Linear systems which will come across in most of practical systems, this course deals about Non – Linearity's	√	√				√

			CO4	since stability is most important for everyu systems to give it satisfactory performance, this topic also helps	√					√
11EE531	Distribution System Planning & Automation		CO1	Understand and distinguish characteristics of distribution systems from transmission systems	√					√
			CO2	To design,analyze and evaluate distribution system design based on forecasted data	√	√	√			
			CO3	Identify and select appropriate sub –station location	√					
			CO4	To understands the applications of GIS/GPS and SCADA systems in Distribution automation	√					
11EE534	Non Conventional Energy Resources		CO1	Introduction of types of non conventional devices	√					√
			CO2	Analysing and design concepts of solar energy systems		√	√		√	
			CO3	Analysing and design concepts of wind energy systems		√	√		√	
			CO4	Case study on different energy systems						√
11EE505	Real Time Control of Power Systems		CO1	Learn various activities of operator	√					
			CO2	Understand about Supervisory control and data acquisition	√					
			CO3	Real time software and state estimation					√	
			CO4	Understand Security management	√	√				
			CO5	**Analyze** simulation results and effective documentation and **Acquire** expertise in usage of modern tools		√	√			
11EE506	Micro Controllers & Embedded Systems		CO1	To know about ARM Processor Registers, Instruction pipeline, Interrupts and Architecture	√					√
			CO2	To learn about Instructions, Addressing modes and conditional instructions	√					√
			CO3	To learn about Cache architecture, Polices, Flushing,	√					√

			CO4	To learn about MMU , page table translation and access permission	√					√
11EE507	Power System Protection		CO1	Understand the various types of comparators and their realization using static circuits	√	√				
			CO2	Understand the realization of over current, distance and differential relays using comparators	√	√				
			CO3	Estimate the current and voltage magnitudes from the sampled measurements			√			
			CO4	Realize the various dynamic characteristics of digital relays for protection of transmission lines, transformers			√			
11EE508	Power Quality		CO1	Understand causes of power quality and types of power quality issues	√					
			CO2	Analyze the performance of electrical systems under voltage sags, swells and interruptions		√	√			
			CO3	Evaluate the performance of electrical systems under the influence of harmonics			√			
			CO4	Analyze power quality monitoring techniques to improve the performance of the electrical system			√			
11EE539	AI Techniques in Power System		CO1	Differentiate between Algorithmic based methods and knowledge based methods	√					
			CO2	Use the soft computing techniques for power system problems	√	√	√			
			CO3	Use appropriate AI framework for solving power system problems	√	√	√			√
			CO4	Apply GA to power system optimization problems		√	√			√

11EE535	Flexible AC Transmission System		CO1	Need and importance of facts device and benfits over HVDC Systems	√					
			CO2	Analyzing FACTS devices for improving system stability		√	√			
			CO3	Analyzing the shunt facts devices		√	√			
			CO4	Analyzing combination of shunt and series facts devics like upfc and upqc		√	√			

K L UNIVERSITY
DEPARTMENT OF MECHANICAL ENGINEERING
PROGRAM DEVELOPMENT DOCUMENT
M.Tech in Mechatronics
2013

Vision of University:

To be a globally renowned university.

Mission of University:

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

Vision of Department:

To be a globally renowned leader in education, research and extension activities in emerging areas of mechanical engineering and allied fields.

Mission of Department:

Training the leaders, innovators and outstanding career professionals of tomorrow and conducting fundamental research to address major technological roadblocks.

Program Educational Objectives

5. Demonstrate a breadth of knowledge of Mechatronics.
6. Demonstrate a depth of knowledge in a chosen focus area, inside or outside of Mechatronics.
7. Demonstrate knowledge of contemporary issues in their chosen focused area
8. Demonstrate the ability to independently complete a technical project

Program Outcome's

f. Advanced knowledge of a broad range of modelling methodologies, and underlying mechanical science, commonly used in the development and analysis of mechatronic engineering systems.

g. Knowledge of fundamental design issues relevant to mechatronic engineering, and an understanding of how to formulate and analyse design solutions in various engineering contexts.

h. Working knowledge of a range of modern mathematical methods and tools used in the development and analysis of mechatronic engineering systems.

i. In-depth knowledge of one or more of the following (depending of selection of option modules and project area): specific engineering systems, design methods, modelling techniques, mathematical and/or numerical techniques.

j. Knowledge of basic research and development principles and practices relevant to mainstream engineering industry.

k. Knowledge of key professional, safety and ethical issues arising in modern engineering industry.

l. Knowledge of time-management and work planning issues related to the organisation, implementation and successful completion, including reporting, of an individual, Masters level, engineering based project.

MAPPING OF PEOs with MISSION OF THE DEPARTMENT:

S.No	Description of PEOs	Key Components of Mission			
		M 1	**M 2**	**M 3**	**M 4**
		Training the leaders of tomorrow	Training the innovators of tomorrow	Training the outstanding career professionals of tomorrow	Conducting fundamental research
PEO 1	Demonstrate a breadth of knowledge of Mechatronics.			✓	✓
PEO 2	Demonstrate a depth of knowledge in a chosen focus area, inside or outside of Mechatronics			✓	✓
PEO 3	Demonstrate knowledge of contemporary issues in their chosen focused area	✓	✓	✓	✓
PEO 4	Demonstrate the ability to independently complete a technical project	✓	✓	✓	✓

\MAPPING OF POs/PSOs with PEOs:

	Key Components of POs and PSOs	Description of PEO			
		Demonstrate a breadth of knowledge of Mechatronics	Demonstrate a depth of knowledge in a chosen focus area, inside or outside of Mechatronics	Demonstrate knowledge of contemporary issues in their chosen focused area	Demonstrate the ability to independentl y complete a technical project
		PEO 1	**PEO 2**	**PEO 3**	**PEO 4**
a	Advanced knowledge of a broad range of modelling methodologies	✓	✓		✓
b	Knowledge of fundamental design issues relevant to mechatronic engineering	✓	✓	✓	✓
c	Working knowledge of a range of modern mathematical methods and tools	✓	✓	✓	✓
d	In-depth knowledge of specific engineering systems, design methods, modelling techniques, mathematical and/or numerical techniques.	✓	✓	✓	✓

e	Knowledge of basic research and development principles and practices	✓	✓	✓	✓
f	Knowledge of key professional, safety and ethical issues			✓	✓
g	Knowledge of time-management and work planning issues related to the organisation				✓

Course Outcomes vs Program Outcomes

Course Code	Course Title	Credits	CO NO	Description of the Course Outcome	a	b	c	d	e	f	g
13MT501	Fundamentals of Mechatronics	3	CO1	Analyze mechatronics in manufacturing and distinguish between traditional and mechatronics approaches	2						
			CO2	Be proficient in the use of Data conversion devices and Microprocessors controllers.	1						
			CO3	Be able to analyze and select suitable drives and mechanisms for industrial applications		2					
			CO4	Design and analyze the Hydraulic systems and understand PID controllers and CNC machines.		2					
13MT502	Advanced Engineering Mathematics	4	CO1	Perform elementary operations on matrices including determination of rank and inverse, demonstrate mastery in using matrix algebra			2	2			
			CO2	Interpret and apply differential calculus on problems involving rate of change			2	2			
			CO3	Illustrate the applications of integral calculus in solving problems on area, volume, displacement, work			2	2			
			CO4	Determine gradient, divergence and curl of vector point functions with their properties			2	2			

13MT503	Sensors and Actuators	3	CO1	Identify appropriate sensor for a particular Mechatronic system.				2				
			CO2	Analysis of hydraulic and pneumatic actuation systems for selection of appropriate actuation method for a particular Mechatronic system.				2				
			CO3	Analysis of electrical actuation systems for selection of appropriate actuation method for a particular Mechatronic system.				2				
			CO4	Understand micro electro mechanical system and its manufacturing methods					1			
13MT504	Modeling and Simulation of Mechatronic Systems	4	CO1	Build mathematical models of mechatronic systems comprising of combinations of mechanical, electrical, pneumatic/ hydraulic and thermal systems.			2	2				
			CO2	Analyze systems for their time response to a certain input using transfer function and /or state space approach	3						3	
			CO3	Apply system identification techniques to synthesize system models	2			2				
			CO4	Evaluate time and frequency response of systems and control system design	1			2				
13MT534	MEMS & NEMS	3	CO1	Introduction to MEMS and Microelectronic technologies used for MEMS	1	2						
			CO2	Microsensors & MEMS applications in Biological, Chemical and Acoustic field.	1	2						

			CO3	Introduction to MEMS based nanotechnology	1	2					
			CO4	NEMS physics and NEMS architecture	1	2					
13MT635	Microprocessors and Embedded Systems	3	CO1	Understand the fundamentals of embedded applications		1					
			CO2	Architectural understanding of processors through interfacing (8086)		1					
			CO3	Programming model of microcontroller (8051 family)		1					
			CO4	Interfacing and programming applications using microcontrollers		2					
13MT601	Robotics: Advanced Concepts and Analysis	3	CO1	Perform Velocity and Static analysis of Manipulators		2					
			CO2	Formulation of equation of motions by computer simulations			3	2			
			CO3	Apply the Planning and control methods for robots					2		
			CO4	Modeling and Controlling of flexible manipulators					2		

13MT602	Control of Mechatronic Systems	3	CO1	Understanding the basic concepts of Modeling, Testing in terms of time domain and frequency domain			1				
			CO2	Analyze the basic designing concepts of Modern and optimal controllers such as state feedback and state observers.	2						
			CO3	Analyze the basic designing concepts of Digital controller for digital systems			2				
			CO4	Analyze the basic designing concepts of Non-linear controllers for non-linear systems			2				
13MT603	Mechatronics Product Design	4	CO1	Identify appropriate sensors, Identify appropriate actuation system for a given application.	1		1				
			CO2	Identify appropriate microcontroller for a given application and to build a mathematical Model of system for evaluating open loop system performance and behavior.			2	3			
			CO3	Suggest an appropriate closed loop control strategy to attain the desired system behavior.			1				
			CO4	Suggest a Mechatronic product design for a given application and evaluate its performance.	2	3					
13MT604	Precision Engineering	4	CO1	To understand concept of accuracy, errors & its causes.					1		
			CO2	To know about geometrical dimensioning and tolerance						2	

			CO3	To understand concept of surface roughness and learn methods to improve surface finish.					1			
			CO4	To understand precision engineering methods					1			
13MT531	Computational Fluid Dynamics	3	CO1	Understand the Fundamentals of CFD and deriving governing equations	2		2					
			CO2	Apply different CFD techniques to diffusion problems	2			2				
			CO3	Solving convection-diffusion problems and N-S equations	2			2				
			CO4	Understand numerical grid generation and apply time integration and turbulence methods to complex flows	2			2				
13MT631	Industrial Automation	3	CO1	Apply principles of automation towards material handling and analyze their performance.		2						
			CO2	Analyze performance of storage systems and product flow in different GT methods and cellular manufacturing.		2						
			CO3	Application and analysis of transfer line without internal storage and describe Inspection Technology			2					
			CO4	Describe different manufacturing supporting systems.			2					

K L UNIVERSITY
DEPARTMENT OF MECHANICAL ENGINEERING
PROGRAM DEVELOPMENT DOCUMENT
M.Tech in Thermal Engineering
2013

Vision of University:

To be a globally renowned university.

Mission of University:

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

Vision of Department:

To be a globally renowned leader in education, research and extension activities in emerging areas of mechanical engineering and allied fields.

Mission of Department:

Training the leaders, innovators and outstanding career professionals of tomorrow and conducting fundamental research to address major technological roadblocks.

Program Educational Objectives

1. Demonstrate a breadth of knowledge of Thermal Engineering.
2. Demonstrate a depth of knowledge in a chosen focus area, inside or outside of Thermal Engineering.
3. Demonstrate knowledge of contemporary issues in their chosen focused area
4. Demonstrate the ability to independently complete a technical project.

Program Outcome's

a. Advanced knowledge of a broad range of modelling methodologies, and underlying mechanical science, commonly used in the development and analysis of Thermal engineering systems.
b. Knowledge of fundamental design issues relevant to Thermal engineering, and an understanding of how to formulate and analyse design solutions in various engineering contexts.
c. Working knowledge of a range of modern mathematical methods and tools used in the development and analysis of Thermal engineering systems.
d. In-depth knowledge of one or more of the following (depending of selection of option modules and project area): specific engineering systems, design methods, modelling techniques, mathematical and/or numerical techniques.
e. Knowledge of basic research and development principles and practices relevant to mainstream engineering industry.
f. Knowledge of key professional, safety and ethical issues arising in modern engineering industry.
g. Knowledge of time-management and work planning issues related to the organisation, implementation and successful completion, including reporting, of an individual, Masters level, engineering based project.

MAPPING OF PEOs with MISSION OF THE DEPARTMENT:

S.No	Description of PEOs	Key Components of Mission			
		M 1	**M 2**	**M 3**	**M 4**
		Training the leaders of tomorrow	Training the innovators of tomorrow	Training the outstanding career professionals of tomorrow	Conducting fundamental research
PEO 1	Demonstrate a breadth of knowledge of Thermal Engineering			✓	✓
PEO 2	Demonstrate a depth of knowledge in a chosen focus area, inside or outside of Thermal Engineering			✓	✓
PEO 3	Demonstrate knowledge of contemporary issues in their chosen focused area	✓	✓	✓	✓
PEO 4	Demonstrate the ability to independently complete a technical project	✓	✓	✓	✓

MAPPING OF POs/PSOs with PEOs:

	Key Components of POs and PSOs	**Description of PEO**			
		Demonstrate a breadth of knowledge of Thermal Engineering	Demonstrate a depth of knowledge in a chosen focus area, inside or outside of Thermal Engineering	Demonstrate knowledge of contemporary issues in their chosen focused area	Demonstrate the ability to independently complete a technical project
		PEO 1	**PEO 2**	**PEO 3**	**PEO 4**
a	Advanced knowledge of a broad range of modelling	✓	✓		✓
b	Knowledge of fundamental design issues relevant to Thermal engineering	✓	✓	✓	✓
c	Working knowledge of a range of modern mathematical methods and tools	✓	✓	✓	✓

d	In-depth knowledge of specific engineering systems, design methods, modelling techniques, mathematical and/or numerical techniques.	✓	✓	✓	✓
e	Knowledge of basic research and development principles and	✓	✓	✓	✓
f	Knowledge of key professional, safety and ethical issues			✓	✓
g	Knowledge of time-management and work planning issues related to the organisation				✓

Course Outcomes vs Program Outcomes

Course Code	Course Title	Credits	CO NO	Description of the Course Outcome	a	b	c	d	e	f	g
13TE501	Numerical Methods in Thermal Engineering	4	CO1	Realize the importance of Numerical and Experimental Investigations	1						
			CO2	Acquire the knowledge in the behavior of fluid flows and heat transfer		2					
			CO3	Develop the discretization equations to the governing equations			2				
			CO4	Adopt a suitable solution technique to the discrerization equations			2				
13TE502	Advanced Thermodynamics	4	CO1	Understanding the concepts of energy, thermodynamic potential and calculation of exergy of a system	3	2					
			CO2	Understanding kinetic theory of gases and intermolecular forces	2		3				
			CO3	Understanding various methods of statistical distribution of particles				2	1		
			CO4	Ability to construct figures for particle allocations depending on various probability disrtibutions				2	2		
13TE503	Design of Thermal Systems	4	CO1	Studying in detail about the Design and Modeling of Thermal Systems.	3	2					
			CO2	Understanding about acceptable design of thermal system and studying its Economic Considerations.				2			2

			CO3	Studying about the problem formulation for optimization and its search methods and understanding Lagrange multiplier.			3		2		
			CO4	Understand about Geometric, linear and dynamic Programming and modeling of thermal equipment.		2		2			
13TE504	Advanced Heat & Mass Transfer	4	CO1	Understand both the physics and the mathematical treatment of one-dimensional, steady-state and Transient conduction heat transfer.	2		2				
			CO2	Analyze free and forced convection problems involving complex geometries with proper boundary conditions			3	3			
			CO3	Apply the concepts of radiation heat transfer for enclosure analysis			3	3			
			CO4	Understand physical and mathematical aspects of mass transfer. Analyze combined heat and mass transfer from plates and in pipes.	3			3			
13TE531	Heat Exchanger Design	3	CO1	Classify heat exchangers and understand thermo hydraulic fundamentals of the exchangers	1						
			CO2	Apply LMTD and ε- NTU methods in the design of different types of heat exchangers	2		2				
			CO3	Apply different methods in the design of shell and tube heat exchangers	2				2		
			CO4	Design of Compact heat exchangers and study of fouling control techniques	2		2				
13TE542	IC Engine Combustion and Pollution	3	CO1	Estimate the emissions from the I C Engines, Understand the combustion in IC Engines and emissions formation	3				3		

			CO2	Understand the SI Engine emission control technology and treatments	2						
			CO3	Understand the CI Engine emission control technology and treatments	2						
			CO4	Calculate the quality of the ignition, Understand the Emission test procedures, standards and fuels quality, emissions	3					3	
13TE601	Incompressible and Compressible Flows	4	CO1	Follow the conservation equations based on control mass system and control volume formulation	1						
			CO2	Familiar with the techniques for analysis of inviscid incompressible flows		2					
			CO3	Familiar with the techniques for the solution of boundary layer equations		2					
			CO4	Understand the formulation of normal and oblique shock waves	2						
13TE602	Computational Fluid Dynamics	4	CO1	Understand the Fundamentals of CFD and deriving governing equations	2		2				
			CO2	Apply different CFD techniques to diffusion problems	2			2			
			CO3	Solving convection-diffusion problems and N-S equations	2			2			
			CO4	Understand numerical grid generation and apply time integration and turbulence methods to complex flows	2			2			
13TE603	Refrigeration and Cryogenics	4	CO1	Apply basic thermodynamic principles to produce low temperature and to the liquefaction systems.	2						

			CO2	Evaluate different types of cryogenic refrigerators and insulations and their applications.	2		2				
			CO3	Examine the properties of matter at low temperature and their measurement.			2				
			CO4	Apply the principle of superconductivity, adiabatic demagnetization and dilution refrigeration etc.to produce low temperatures	2						
13TE604	Measurements in Thermal Engineering	4	CO1	Apply the scientific and engineering methods for field measurement and derived quantities			2	2			
			CO2	Analyze principles of presentation, estimation and data analysis				2	2		
			CO3	Apply the measurement of field quantities with probe and non-instructive techniques		3		2			
			CO4	Evaluate the measurement of derived quantities and analytical methods				2	2		
13TE632	Gas Turbine Engineering	3	CO1	Analysis of gas turbine cycles	2						
			CO2	Analyze performance characteristics of compressor and turbine	2						
			CO3	Understand material selection and fabrication techniques of gas turbine components	2						
			CO4	Analyze gas turbine power generation and cogeneration systems	2						
13TE642	Renewable Energy Technology	3	CO1	Understand different types of renewable energy sources and analyze their energy production	2	2					

			CO2	Understand the principle of OTEC, wind power and Analyze their effects in power generation	2	2						
			CO3	Understand different conversion techniques of biomass to useful fuel	3	3						
			CO4	Analyze various types of Geo Thermal energy sources and their extraction techniques and apply them for conversion	3	3						

K L University

Department of ECE

Academic Year 2013 VLSI

M.Tech Program

Mapping of ECE Department M.Tech (VLSI) Mission Statement with POs, PSOs and PEOs

Program Outcomes

Mission statement of K L University

Vision

To be a globally renowned university.

Mission

To impart quality higher education and to undertake research and extension with emphasis on application and innovation that cater to the emerging societal needs through all-round development of students of all sections enabling them to be globally competitive and socially responsible citizens with intrinsic values.

Vision and Mission statement of ECE department

VISION

- To evolve into a globally recognized department in the frontier areas of Electronics & Communication Engineering (ECE).

MISSION

M1- To produce graduates having professional excellence.

M2- To carry out quality research having social & industrial relevance.

M3- To provide technical support to budding entrepreneurs and existing

PROGRAM EDUCATIONAL OBJECTIVES (PEOS):

- **PEO1:** Employability in the diversified sectors of core industry, public sector or multinational corporations, in the domain of Semiconductor Technology, ASIC Design and Verification, Embedded Systems - Hardware and Software Development.
- **PEO2:** Ability to pursue higher education in technologies related to VLSI and Embedded Systems at institutes of repute and high standard leading to contributions to technology.
- **PEO3:** Attitude of lifelong learning and skills of effective inter-person communication resulting in leading diverse teams, with ethical and social behavior.

Programe Outcomes

PO1	a	Apply the knowledge of science, mathematics, and engineering principles for developing problem solving attitude.
PO2	b	Identify, formulate and solve engineering problems in the broad areas like System Design using VLSI and Embedded Platforms and tools, Semiconductor Technologies, Applications in Signal Processing, Machine Vision and Communication Networks.
PO3	c	Use different software tools in the domain of VLSI and Embedded Systems Design, Analysis and Verification such as Design entry, Synthesis, Functional and Timing Simulation, Floor-planning, Place and route, Layout editors, RTL schematic, Platform specific EDA sets, MATLAB.
PO4	d	Design and conduct experiments, analyze and interpret data, imbibe programming skills for development of simulation experiments.
PO5	e	Function as a member of a multidisciplinary team with sense of ethics, integrity and social responsibility.

Mapping of Mission statements with program educational objectives

	M1	M2	M3
PEO1	✓	✓	
PEO2		✓	✓
PEO3	✓		

Mapping of PEOs with Pos and PSOs

	PEO1	PEO2	PEO3
PO1	✓		
PO2	✓	✓	
PO3	✓		
PO4		✓	✓
PO5			✓

2013-14 (Semester I)									
S.NO	**COURSE CODE**	**COURSE NAME**	**Cos**	**COURSE OUTCOME**	**P01**	**PO2**	**PO3**	**PO4**	**PO5**
1	13 EC 553	IC Fabrication	1	Ability to understand the Concepts of fabrication and steps following for fabrication			3		
			2	Understand different modelling technologies and materials used for fabrication		3			
			3	Ability to understand the concepts of lithography and deposition		2			
			4	Analyze the various etching technologies for preparation of ICs		2			
2	13EC552	HDL & PLD Architectures	1	Understand the basics concepts of digital system design, their modeling techniques in Verilog HDL.	3				
			2	Design of various Combinational & Sequential Logic realizations using Verilog HDL.			3		
			3	Compare and analysis of different PLD's and CPLD's architectures.		2			
			4	Memorize and analysis of different FPGA architectures.			2		
			5	Create and Analysis of digital modules through project oriented approach				2	3
3	13EC550	MOS CIRCUIT DESIGN	1	Understand the basics concepts of digital system design, their modeling techniques in Verilog HDL.		2			
			2	Design of various Combinational & Sequential Logic realizations using Verilog HDL and design flow			2		
			3	Characteristics of inverter and calculation of different delays			2		
			4	Design of different combinational and sequential circuits			2		
			5	Create and Analysis of digital modules through project oriented approach				2	3
4	13EC551	ALGORITHMS FOR VLSI DESIGN	1	Ability to understand the Concepts of design methodologies in routing and layout	2		3		
			2	Understand different levels of modelling of digital circuits and scheduling	2		2		
			3	Ability to understand the FPGA Technologies for development of physical design	3		2		
			4	Analyze the routing and distribution of cells in ICs			3		

5	13EC520	IMAGE & VIDEO PROCESSING	1	Ability to understand the different transforms for image processing		3			
			2	Understand different techniques for image processing	3	2			
			3	Ability to understand the concepts of Image Compression		2			
			4	Analyze the various steps in video processing	3	2			
6	13EC559	VLSI SIGNAL PROCESSING	1	Ability to understand the architectures of DSP Systems		2			
			2	Understand Data Flow Graphs and iteration bounds			2		
			3	Ability to understand the Parallel Processing and Pipelining		3			
			4	Analyze the various algorithms and convolutions for filters		3			
2013-14 (Semester I)									
1	13EC570	Advanced Analog IC Design	1	Understand the operation of different current mirrors	2				
			2	Analyze the frequency response of different Amplifiers.	2				
			3	Design of two stage Op-Amp using single stage Op-Amp				2	
			4	Describe the various Feedback topologies.	2				
			5	Understand and apply the concepts of Non Linear Analog circuits.	2		2		
2	13EC555	Low Power VLSI Circuits	1	Understand power dissipations concepts related to VLSI circuits			2		
			2	Evaluate the performance of different circuits using simulation & probabilistic power analysis.			3		
			3	Analyze low power techniques at logical, circuit, architectural and systems level			2		
			4	Analyze Clock Distribution techniques, Special techniques				2	
			5	Project based lab				2	3
3	13EC556	VLSI System Design	1	Ability to understand the importance Programmable devices in VLSI			2		
			2	Understand difference between Data path sub system and array subsystem				2	
			3	Ability to understand the methodology of interconnects			2		
			4	Analyze synchronization of clock and synthesis of different disigns			2		

4	13EC571	Testing of VLSI Circuits	1	Understanding and application user-defined primitives in Fault dominance, understanding various simulation and Gate level event-driven simulation for digital circuits.		3			
			2	Understanding, Test generation for various Combinational logic circuits and ability to design its Testable Combinational circuits.		2			
			3	Design for Testability, Generic scan based design and Classical scan based design		2			
			4	Analyze and ability to Testable various BIST– MBIST, LBIST. Fault Diagnosis of digital circuits and Diagnosis by UUT reduction.		2			
5	13EC562	System On Chip Design	1	To understand the basic concepts of SOC design.		2			
			2	To summarize and explain the performance evaluation methods	2				
			3	To classify and understand the power management process and modeling design tools			2		
			4	To understand and study the micro-architecture design and modeling, software and hardware design verifications	2		1		
6	13EC568	ASIC Design Flow	1	Develop Program of different logic circuits using Verilog Programming and analyze different types of Faults in logic circuits.			2		
			2	Analyze different types of ASIC design methodologies and Different CPLD		2			
			3	Analyze ASIC design flow of customized ASICs			3		
			4	Analyze Physical design flow of ASIC, Extraction the final circuit			2		

Professor incharge Head of the department

K L UNIVERSITY

DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE ENGINEERING

2013

M.TECH (WIRELESS COMMUNICATIONS AND SENSOR NETWORKS)

VISION

To promote innovation centric education and perform cutting edge research in interdisciplinary and multidisciplinary areas**.**

MISSION

To impart **value-based, state-of-art education** and motivate the students to become **socially committed professionals** for **overall development** of students

M1: Impart Value –Based Education

M2: Impart State of the art –education

M3: Motivate Students to become Socially Committed Professionals

M4: Overall Development of Students

PROGRAM EDUCATIONAL OBJECTIVES (PEOS) :

M. Tech. in Wireless Communications and Sensor Networks Program, graduates will be able to

PEO1: To mould the students to become effective global engineering students in the competitive environment of modern society.

PEO2: To develop communication, analytical, decision-making, motivational, leadership, problem solving and human relations skills of the students.

PEO3: To pursue lifelong learning as a means of enhancing knowledge and skills necessary to contribute to the betterment of profession.

PEO'S AND MISSION STATEMENT MAPPING

	M1	M2	M3	M4
PEO1		√		√
PEO2	√	√	√	√
PEO3	√		√	√

PROGRAM OUTCOMES(PO's)

M. Tech. in in Wireless Communications and Sensor Networks Program, Graduates will be able to:

PO1: To demonstrate the skills to meet the current and future industrial challenges in the field of Wireless communications and Sensor Networks.

PO2: Able to create, develop, apply, and disseminate knowledge within the Wireless Sensor Networks development environment.

PO3: Ability to communicate effectively and professionally.

PO4: Develop professional and ethical attitude and become socially responsible citizens.

PO5: Ability to carry out cutting edge research in the emerging areas of Wireless communications and Sensor Networks.

PO6: Demonstrate their role as engineers or entrepreneurs and contribute to the society.

MAPPING OF PEO's WITH PROGRAM OUTCOMES (PO'S)

	PEO1	PEO2	PEO3
PO1	√		√

PO2	**√**	**√**	
PO3	**√**		
PO4		**√**	
PO5	**√**		**√**
PO6	**√**	**√**	

COURSE VS POS & PSO'S MAPPING

Course Code	Course Title	L-T-P	CREDITS	CO		Program Outcomes(POs)					
						PO1	PO2	PO3	PO4	PO5	PO6
13EM511	Computational Methods and Error Analysis	3-1-0	4	CO1	Analyse the errors in numerical calculations	2					
				CO2	Apply computational methods for curve fitting		2				
				CO3	Understand the Numerical differentiation and Numerical Integration					1	1
				CO4	Understand the Matrices and Linear system of equations and finite difference methods		1				
13EM512	Wireless Communications & Networks	3-1-2	5	CO1	Remember and understand the mobile	1					

					and wireless networks						
				CO2	Understand the concepts of GSM and wireless MAC		1				
				CO3	Understand the concepts of MANETs and Mobile IP					1	
				CO4	Remember the basics of broadcast systems						1
13EM513	Sensors and Sensing Principles	3-1-0	4	CO1	Remember and understand the sensor fundamentals	1					
				CO2	Understand the physical and chemical sensors		1				
				CO3	Illustrate and understand the optical sensors					1	
				CO4	Understand the bio sensors						1
13EM514	Data Acquisition and Hardware Networks	3-1-2	5	CO1	Analyse the various power supplies and filters used	2					
				CO2	Understand sensor signal condioning circuits		1				1
				CO3	Understand the wired communications					1	
				CO4	Analyse the serial communication process		2				
13EM515	MEMS & NEMS	3-1-0	4	CO1	Overview of MEMS and Micro Systems	1					
				CO2	Understand the Basics of MEMS technology and micro system design		1				

				CO3	Analyse the micro system design					2	
				CO4	Remember and understand the fabrication methods involved						1
13EM516	Communications Protocols and Standards	3-1-2	5	CO1	Remember and understand the networks in process automation	1					
				CO2	Illustrate the various communication protocols		1				
				CO3	Understand wired communication and fieldbus					1	
				CO4	Understand the basics of wireless personal area networks						1
13EM517	Wireless Sensor Networks	3-1-2	5	CO4	Understand different types wireless network their protocols and security issues	1					
				CO4	analysis of difference between wireless networks , hardware devices and disigning issues		2				
				CO4	understand the WSN Gateway and their designing principle					1	
				CO4	understanding of Quality of sensor, Target detection tracking						1

13EM518	Design and Analysis of Algorithms	3-1-0	4	CO1	Understading basics of design and Analysis of Algorithm	1					
				CO2	Analyse the search and sorting methods and greedy methods		2				
				CO3	Design algorithm for shortest path problem and reliable design	2					
				CO4	Analyse NP- Hard and NP-Complete problem					2	
13EM533	Advanced Data Communications	3-0-0	3	CO1	Understanding Digital Modulation Techniques	1					
				CO2	study and Analyse Different protocols of data communication		2				
				CO3	understanding different erroe correcting and error detecting techniues						2
				CO4	Analysis of multiple techniques TDMA, CDMA,SDMA					2	
13EM535	Database management systems	3-0-0	3	CO1	Understand Basic Concepts of DBMS	1					
				CO2	Understanding database Designing models		1				
				CO3	study the States of transaction and locking techniques						
				CO4	analyse Database file storage, recovery and failure issues	2					

13EM541	Advanced Wireless Networks	3-0-0	3	CO1	Remember and Understand the Evalution of wireless network	1					
				CO2	understanding the wireless network architecture and application level signaling		1				
				CO3	Analyse basic Issues of mobility management					2	
				CO4	Challenges in wireless network Quality of Service						1
13EM546	Advanced Microcontroller and its Applications	3-0-0	3	CO1	Overview of Microprocessor and microcontroller functioning, RISC and CISC processor	1					
				CO2	understanding the architecture of ARM Proceossor and Instruction set and THUMB Instruction set		1				
				CO3	understaing PIC Microcontroller instruction set and communication models					1	
				CO4	Designing program concept for intfacing devices						1