DEPARTMENT OF ELECTRONICS AND COMPUTER SCIENCE ENGINEERING

STUDENT HAND BOOK

2017-2018

K L University
u/s 3 of UGC Act, 1956
Koneru Lakshmaiah Education Foundation

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.

PEO'S Vs MISSION STATEMENT MAPPING

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

PROGRAM OUTCOMES(PO's)

PO No	Description
PO1	An ability to apply knowledge of **mathematics, science, engineering fundamentals** and an engineering specialization for the solution of complex engineering problems in Electronics and Computer Science Engineering
PO2	An ability to identify, **formulate, research literature, analyze** complex engineering problems in Electronics and Computer Science Engineering using first principles of mathematics, natural sciences and engineering sciences
PO3	An ability to **design solutions for complex engineering problems** and system component or processes that meet the specified needs **considering public health & safety and cultural, societal & environment**

PO No	Description
PO4	An ability to **use research-based knowledge and research methods including design of experiments**, analysis and interpretation of data and synthesis of the information **to obtain solutions to Electronics and Computer Science Engineering problems**
PO5	Ability to create, select and apply appropriate techniques, resources and modern engineering activities, with an understanding of the limitations
PO 6	Ability to apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice
PO7	Ability to demonstrate the knowledge of engineering solutions, contemporary issues understanding their impacts on **societal and environmental contexts, leading towards sustainable development**
PO8	An ability to **apply ethical principles** and commit to professional ethics and responsibilities and norms **of engineering practice**
PO9	An ability to **function effectively as an individual, and as a member or leader** in diverse teams and in multi-disciplinary settings
PO10	Ability to **communicate effectively oral, written reports and graphical forms** on complex engineering activities
PO11	Ability to demonstrate knowledge **and understanding of the engineering and management principle**s and apply those **one's own work, as a member and leader in team, to manage projects and in multi-disciplinary environments**
PO12	An ability to **recognize the need for and having the preparation and ability to engage independent and life-long learning in broadest context of technological change**

PROGRAM SPECIFIC OUTCOMES(PSO's)

PSO1	An ability to solve Electronics Engineering problems, using latest hardware and software tools, to arrive cost effective and appropriate solutions in the domain of embedded systems and Internet of Things.
PSO2	An ability to demonstrate basic knowledge of Web Technologies for development of web based applications along with knowledge and skill related to cyber security.

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

	PEO1	PEO2	PEO3	PEO4
PO1	√	√		
PO2	√	√		
PO3	√	√		
PO4	√	√		
PO5	√	√		
PO6	√	√	√	
PO7	√	√		
PO8			√	
PO9				√
PO10	√	√		

PO11				**√**
PO12	**√**	**√**		
PSO1	**√**	**√**	**√**	**√**
PSO2	**√**	**√**	**√**	**√**

COURSE VS POs & PSOs MAPPING

COURSE CODE	COURSE NAME	L-T-P	CREDITS	CO NO	Description of the Course Outcome	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	PSO1	PSO2
17EN1201	BUILDING BLOCKS FOR COMMUNICATION SKILLS			CO1	Improve pronunciation skills and understand the method of identifying antonyms.										2				
				CO2	Apply writing strategies for office/ formal communication										2				
				CO3	Analyze types of reading techniques and improve reading speed.										2				
				CO4	Analyze different cultures and the importance of empathy in cross-cultural communication.								2						
17EM2103	COMPUTER ORGANIZATION	2-2-2	4	CO1	Understand the logical gates to construct combinational & sequential circuits to perform Arithmetic µ-			1		1									

					Operations.													
				CO 2	Write Micro Programs for design of Control Unit			1		1								
				CO 3	Analyze operations like Multiplication, Floating Point algorithms			2		2								
				CO 4	Understand the Peripherals, I/O interface and Direct Memory Access			1		1								
				CO 5	Examine the functional verification of the digital circuits on Logisim			3		3							3	
17EM2207	**ELECTRONIC DEVICES AND CIRCUITS**	2-2-2	4	CO 1	Analyze the concepts of various diodes and their applications.			2										
				CO 2	Analyze BJT concepts as operation, biasing and frequency response			2										
				CO 3	Analyze FET concepts as operation, biasing and frequency response			2										
				CO 4	Analyze the usage of Power Amplifiers			2										
				CO 5	Develop applications involving the usage of Diodes,BJT,FET and power amplifiers					3								
17E	**LINEAR**	2-2-2	4	CO 1	Analyze the concepts of			2										

M3108	**INTEGRATED CIRCUIT ANALYSIS**				operational amplifiers and their applications														
				CO2	Analyze the concepts of various active filters and their applications			2											
				CO3	Analyze the concepts of various Feedback amplifiers and their applications			2											
				CO4	Analyze the concepts of various data converters and their applications			2											
				CO5	Develop applications involving the usage of opamps,filters,feedback amplifiers and data converters					3									
17EM2204	**PROCESSORS AND CONTROLLERS**	2-2-2	4	CO1	Able to understand and analyze the architectural features of CISC type of General purpose processor Intel 8086 Microprocessor.		1			1									
				CO2	Able to understand and analyze the architectural features of CISC type of microcontroller - Intel 8051 Microcontroller.		2			2									
				CO3	Able to program 8086 microprocessor,		2			2									

					8051 microcontrollers in assembly language using TASM, KEIL, MPLAB and Proteus tools													
				CO 4	Able to Understand and analyze the architectural features of Atmega processor.		2			2								
				CO 5	Able to Develop a real time application using 8051 &Atmega processors through project based labs.		3			3							3	
17EM3106	**EMBEDDED SYSTEMS DESIGN**	2-2-2	4	CO 1	Able to analyze embedded systems and program on chip peripherals for a single purpose controller			2		2								
				CO 2	Able to interface and program different off chip peripherals and communication protocols used in embedded systems			2		2								
				CO 3	Able to understand, evaluate and select appropriate software architectures			3		3								
				CO 4	Able to analyze and design embedded			2		2								

					systems using the features in real time operating systems.														
				CO 5	Able to develop a prototype for a real time embedded application using project based labs.			3		3								3	
17EM3205	**FPGA BASED SYSTEM DESIGN**	2-2-2	4	CO 1	Understand the basic concepts of Verilog programming		1												
				CO 2	Understand the Combinational & sequential logic circuits and analyze them through test benches using Verilog HDL		2												
				CO 3	Understand FPGA based embedded processors architectures		1												
				CO 4	Understand signal conditioning and serial communication protocols		1												
				CO 5	Analyze the digital modules through project oriented approach					2									
17EM4109	**FUNDAMENTALS OF COMMUNICATION**	2-2-2	4	CO 1	Understand the basics of Amplitude modulation	1	1												
				CO 2	Demonstrate the AM and FM transmitter and Receiver circuit	1	1												

	SYSTEMS			CO 3	Demonstration of PCM	1	1												
				CO 4	Discuss about different types of Keying Techniques in Digital modulation	1	1												
				CO 5	Verification of Analog nd Digital modulations	2	2												
17 CS 2008	**SOFTWARE ENGINEERING**	3-1-0	4	CO 1	Identify software evolution and software development life cycle with associated process models by emphasizing agile methodology including modeling core principles	2													
				CO 2	Demonstrate the concepts of requirement modeling carrying out the analysis and basic design model with a case study		2		2				2						
				CO 3	Classify Software Architecture, Software design and Demonstrate User Interface for an application using golden rules of HCI		2		2										
				CO 4	Evaluate testing strategies and software quality		3												

					assurance for a given case study.													
17CS2210	**DATABASE MANAGEMENT SYSTEM**	2-2-2	4	CO1	Illustrate the functional components of the DBMS, importance of modeling in design of a database				1									
				CO2	Build queries using SQL and concepts of relational algebra			2	2									
				CO3	Apply normalization techniques and indexing to construct and access decent database				2									
				CO4	Understand importance of transaction processing and concurrency control				1									
				CO5	Create a good database and develop SQL queries for data analysis				3	3							3	
17CS2211	**DESIGN AND ANALYSIS OF ALGORITHMS**	2-2-2	4	CO1	Understand time and space complexity, analyze complexity for problems solvable by divide and conquer technique		1											
				CO2	Apply greedy and dynamic algorithm design					2								

					methodologies to solve problems.													
				CO 3	Apply state space tree methods for solving searching problems.		2											
				CO 4	Distinguish between P and NP classes of problems and solve complex problems		2											
				CO 5	Apply algorithm design techniques to solve any real world problems					3							3	
17 CS 31 13	**OPERATING SYSTEMS**	2-2-2	4	CO 1	Explain Operating System Concepts and Evaluation of Operating Systems	1	1											
				CO 2	Illustrate a process, synchronization of process and IPC. **Implement** algorithms for Deadlocks using Banker's Algorithm				2									
				CO 3	Demonstrate paging techniques and **Implement** Virtual Memory using Page Replacement Algorithms				2									
				CO 4	Implement the File management process in OS		2											

				CO 5	Develop Application Programs using UNIX System Calls (Lab Component)					3							3	
17CS3114	**COMPUTER NETWORKS**	3-0-2	4	CO 1	Understand the basics of networking and function of physical Layer	1												
				CO 2	Understand the functions of Data Link Layer and apply the principles into program practice.	1	1											
				CO 3	Understand the functions of Network layer and use routing algorithms into program practice.	1	1											
				CO 4	Apply the Transport and application layer principles into programming.		2											
				CO 5	Experiment with Networking programs		3											
17EM3110	**INTERNET PROGRAMMING**	2-2-2	4	CO 1	Able to create Static Web pages using basic HTML & apply CSS		3			3								
				CO 2	Able to apply javascript features for form validations and event handling		2			2								

				CO 3	Able to create databases using MYSQL and apply JDBC concepts to connect to a database.		3			3								
				CO 4	Able to create dynamic web pages using servlets & JSP		3			3								
				CO 5	Must be able to design WEB site considering the user interface, navigation and interaction with database using project based LABS		3			3								3
17EM3211	**AUTOMATA AND COMPILER DESIGN**	2-2-2	4	CO 1	Able to analyze formal languages, Grammars and finite automata	2				2								
				CO 2	Able to analyze the grammar based on top down and bottom up parser.	2				2								
				CO 3	Able to understand SDT and generate intermediate code	1				1								
				CO 4	Able to apply code optimization techniques	2				2								
				CO 5	Able to Analyze various phases of compiler through project based labs	2				2								

17EM3112	**NETWORK SECURITY**	2-2-2	4	CO1	Apply Symmetric key cryptography techniques to encrypt and decrypt data	2													
				CO2	Apply public key cryptography techniques to encrypt and decrypt data	2													
				CO3	Apply Hash Function and Digital Signature to authenticate the data	2													
				CO4	Understand basic network and system level security concepts	1													
				CO5	Develop applications involving protection of data using symmetric key,public key ,MAC and Digital signature techniques.		3			3									3
17EM3251	**ADVANCED EMBEDDED PROCESSOR ARCHITECTURES**	3-0-0	3	CO1	Able to understand and analyze the 3 and 5 stage pipelines of ARM and able to program the ARM processor.					1	1							1	
				CO2	Able to program the on chip & off chip peripherals of ARM 7 controller.					2	2							2	
				CO3	Understand and analyze the AMBA bus architecture and different advanced ARM cores.					2	2							2	

				CO 4	Able to analyze the different SOC applications using ARM cores.					2	2						2		
17EM4154	**EMBEDDED LINUX**	3-0-0	3	CO 1	Able to understand embedded Linux development environment, understand and create Linux BSP for a hardware platform.					1							1	1	
				CO 2	Able to program different embedded storage devices					2							2	2	
				CO 3	Able to understand the Linux model for embedded storage, understand and write various embedded Linux drivers such as serial, I^2C, and so on.					2							2	2	
				CO 4	Able to port applications to embedded Linux and write real – time applications in embedded Linux.					3							3	3	
17EM4155	**NETWORKING OF EMBEDDED SYSTEMS**	3-0-0	3	CO 1	Able to understand and develop applications using Rs-232C, RS-485 and SPI communication protocols.					1	1						1		

				CO 2	Able to understand and develop applications using I^2C, USB communication protocols.					1	1						1		
				CO 3	Able to understand and develop applications using CAN communication protocols					1	1						1		
				CO 4	Able to understand and analyze different wireless communication protocols used in Embedded Systems.					2	2						2		
17EM4156	**SYSTEM ON CHIP ARCHITECTURES**	3-0-0	3	CO 1	Able to understand and analyze different Design and Validation methodologies for logic cores such as memories, analog devices and SoCs.					2		2						2	
				CO 2	Able to understand On chip Communication Architecture Standards					1		1						1	
				CO 3	Able to analyze security issues of On chip Communication Architecture standards					2		2						2	

				CO 4	Able to understand and analyze different topologies of Networks on Chip.					2		2					2	
17EM4157	**HARDWARE SOFTWARE CO-DESIGN**			CO 1	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					2						2	2	
		3-0-0	3	CO 2	Analyze Validation and Verification Techniques, design specification for embedded processor architectures					2						2	2	
				CO 3	Analyze the compilation techniques and tools for embedded processor architectures					2						2	2	
				CO 4	Understand the standard design methods like COSYMA system and LYCOS systems.					1						1	1	
17EM3252	**SENSORS AND SENSING PRINCIPLES**	3-0-0	3	CO 1	Able to understand and analyze the sensor fundamentals, principles and							1				1		

					characteristics													
				CO 2	Understand the application of various physical and Chemical sensors						1					1		
				CO 3	Understand the application of various optical sensors						1					1		
				CO 4	Able to understand the different bio sensors and its limitations.						1					1		
17EM4158	**WIRELESS COMMUNICATIONS & NETWORKS**	3-0-0	3	CO 1	Able to understand Transmission fundamentals and communications networks and application protocol architecture						1					1		
				CO 2	Able to understand and analyze signal encoding techniques, spectrum and different wireless networks						1					1		
				CO 3	Able to understand and analyze various principles of cellular wireless networks						1					1		
				CO 4	Able to understand wireless protocols and applications of						1					1		

					IEEE802.11 architecture and standards														
17EM4159	**WIRELESS SENSOR NETWORKS**.	3-0-0	3	CO1	Able to understand Cellular and adhoc networks in detail					1						1			
				CO2	Able to understand wireless sensor networks data communications to other networks which involves its design and principles					1						1			
				CO3	Able to understand various MAC protocols for sensor networks					1						1			
				CO4	Able to understand and analyze various routing techniques of wsn and ad hoc networks					1						1			
17EM4160	**SENSOR NETWORKS PROGRAMMING**	3-0-0	3	CO1	Able to understand fundamentals of TinyOS and nesC in wsn environment.					1						1			
				CO2	Able to understand real world programming of wireless sensor network in different scenarios.					1						1			
				CO3	Able to understand the					1						1			

					performance analysis of power-aware algorithms													
				CO 4	Able to understand and develop energy efficient algorithms for wireless sensor networks thru simulation or real time experiments					1						1		
17EM4161	**REMOTE SENSING**	3-0-0	3	CO 1	Able to understand relations of remote sensing with atmosphere and earth					1						1		
				CO 2	Able to understand and remote sensing platforms and sensors for data analysis and interpretation					1						1		
				CO 3	Understand the basic components of GIS					1						1		
				CO 4	Understand data storage and analysis of GIS data.					1						1		
17EM3253	**WEB SERVICES**	3-0-0	3	CO 1	Must be hands-on in developing two tier/ three tier WEB based applications using APACHE and NETBEANS as the Platform		1			1								
				CO 2	Must have theoretical knowledge of all		1			1								

					the programming languages, WEB services related technologies and API as detailed in the syllabus														
				CO 3	Able to understand fundamentals of SOAP,WSDL & UDDI		1			1									
				CO 4	Must be able to design, develop, register, deploy WEB Services and develop a real life application considering WEB services server and UDDI registry		2			2									
17EM4162	**WEB SEMANTICS**	3-0-0	3	CO 1	Must Acquire theoretical knowledge related to WEB semantics, ontology learning and languages that can be used for the development of WEB semantics		1			1									
				CO 2	Must be knowledgeable using tools to develop web semantics for various real life applications		1			1									
				CO 3	Able to understand ontology Management & learning for		1			1									

					semantic web													
				CO 4	Must develop a real life application that require use of WEB semantics		2			2								
17EM4163	**ENTERPRISE PROGRAMMING**	3-0-0	3	CO 1	Must acquire theoretical knowledge related to enterprise architectures, development platforms, Application servers, EJB components, EJB query language.		1			1								
				CO 2	Must be hands-on developing EJB components using NETBEANS and deploy the components using JBOSS		1			1								
				CO 3	Able to understand EJB QL & develop sample applications		1			1								
				CO 4	Must develop real life Enterprise wide application based on EJB and JBOSS and SQL server as DBMS engine		3			3								
17EM4164	**CLOUD BASED WEB DEVELOPMEN**	3-0-0	3	CO 1	Must acquire theoretical knowledge related to WEB Applications,		1			1								

	T				Cloud computing and deploying WEB applications on the cloud														
				CO 2	Must be hands-on developing WEB Applications using Google APP / Open ERA		1			1									
				CO 3	Able to understand basic cloud based application development environment		1			1									
				CO 4	Must be able to develop real life cloud based applications through Google APP / Open ERA		3			3									
17EM4165	**WEB ANALYTICS**	3-0-0	3	CO 1	Must acquire theoretical knowledge related to WEB Analytics, processing clicked streams, metrics for WEB analytics		1			1									
				CO 2	Must be hands-on developing WEB Analytics using NINJA		1			1									
				CO 3	Able to understand basics of analytics related to social,mobile & video.		1			1									
				CO 4	Must be able to develop		2			2									

					applications that require WEB analytics														
17EM4168	**WIRELESS TECHNOLOGIES FOR IOT**	3-0-0	3	CO 1	Remember and understand Radio Frequency (RF) Fundamentals	1											1		
				CO 2	Illustrate the various cellular standards	1											1		
				CO 3	Understand the different wireless technologies	1											1		
				CO 4	Understand the basics of embedded wireless application development.					1							1		
17EM4169	**IOT APPLICATION DEVELOPMENT THROUGH PYTHON**	3-0-0	3	CO 1	Understand the vision of IoT from a global context.	1				1									
				CO 2	Understanding of Python Language and development boards.	1				1									
				CO 3	Understanding and Building the application for IoT using Python.		1			1									
				CO 4	Use of Devices, Gateways and cloud management in IoT.	2				2									
17EM4159	**WIRELESS SENSOR NETWORKS**	3-0-0	3	CO 1	Able to understand Cellular and adhoc networks in detail					1							1		
				CO 2	Able to understand wireless sensor networks data communications to other networks which involves its					1							1		

					design and principles													
				CO 3	Able to understand various MAC protocols for sensor networks					1						1		
				CO 4	Able to understand and analyze various routing techniques of wsn and ad hoc networks					1						1		
17EM3252	**SENSORS AND SENSING PRINCIPLES**	3-0-0	3	CO 1	Able to understand and analyze the sensor fundamentals, principles and characteristics							2				2		
				CO 2	Understand the application of various physical and Chemical sensors							1				1		
				CO 3	Understand the application of various optical sensors							1				1		
				CO 4	Able to understand the different bio sensors and its limitations.							1				1		
17EM3254	**FUNDAMENTALS OF IOT**	3-0-0	3	CO 1	Understand the basic concepts of IOTs & some related issues of IOTs							1				1		
				CO 2	Understand the Issues of Security, standards and Protocol Convergences with IOTs & Vision							1				1		

					over M2M Vs. IOTs													
				CO 3	Understand the Architectural overview, Reference Models based Architecture of IOTs						1					1		
				CO 4	Analyze the IOT Smart Applications and Cloud support for IOT						2					2		
17EM3255	**FUNDAMENTALS OF CYBER SECURITY**	3-0-0	3	CO 1	Understand the need for cyber security and analyze the risk involved				1									1
				CO 2	Analyze various types of security threats and electronic payment systems				2									2
				CO 3	Analyze the security issues involved in developing secure information systems				2									2
				CO 4	Analyze the security policies standards and cyber laws				2									2
17EM4170	**MOBILE AND WIRELESS SECURITY**	3-0-0	3	CO 1	Analyze the Security and Privacy aspects of Mobile and Wireless Networks				2									2
				CO 2	Understand the mobile system architectures and related security issues				1									1
				CO 3	Analyze the security issues in wireless networks				2									2
				CO 4	Analyze RFID security and privacy issues				2									2
17EM4173	**EMBEDDED SECURITY**	3-0-0	3	CO 1	Analyze the building blocks of embedded security applications				2									2
				CO 2	Analyze the security requirements ,attacks and privacy solutions of				2									2

					embedded systems													
				CO 3	Analyze the hardware based content protection mechanisms				2									2
				CO 4	Analyze the basic utilities of embedded security				2									2
17EM4171	**COMPUTER FORENSICS**	3-0-0	3	CO 1	Understand the principles and methodologies of digital forensics				1									1
				CO 2	Analyze the techniques involveved in data acquisitions and duplication				2									2
				CO 3	Analyze the vulnerabilities in routers				2									2
				CO 4	Understand the basics of forensics acquisistion				1									1
17EM4172	**RISK MANAGEMENT AND SECURITY AUDIT**	3-0-0	3	CO 1	Understand the importance of information security risk assessment and data collection mechanisms				1									1
				CO 2	Compile the risk score base don observations				1									1
				CO 3	Analzye the risk priority and its consequences				2									2
				CO 4	Perform Audit and follow up activities				2									2
17EM30B2	**E-COMMERCE**	3-0-0	3	CO 1	Analyze various E-Commerce Business Models and Infrastructure							2						
				CO 2	Understand the Ethical, Social and Political issues in E-Commerce								1					
				CO 3	Analyze Marketing communications and Internet					2								

					resources for E-Commerce														
				CO 4	Analyze the internet applications for commerce					2									
17 EM 30 B1	**INTERNET OF THINGS**	3-0-0	3	CO 1	Understand the paradigm shift from M2M to IOT							1							
				CO 2	Understand the fundamentals of IOT Technology							1							
				CO 3	Understand the architecture of IOT							1							
				CO 4	Understand the reference architecture of IOT							1							
17 EN 12 01	**BUILDING BLOCKS FOR COMMUNICATION SKILLS**	0-0-4	2	CO 1	Improve pronunciation skills and understand the method of identifying antonyms.										2				
				CO 2	Apply writing strategies for office/ formal communication										2				
				CO 3	Analyze types of reading techniques and improve reading speed.										2				
				CO 4	Analyze different cultures and the importance of empathy in cross-cultural communication.								2						
17 EN 31 02	**INSTANT COMMUNICATION SKILLS**	0-0-4	2	CO 1	Analyse the concept of Group Discussion and speak effectively during the discussion.										2				

				CO 2	Apply and analyze various concepts of writing strategies in professional communication skills like, reports, proposals and minutes of the meeting.									2				
				CO 3	Analyse vocabulary and apply the types of reasoning in comprehending the information.									2				
				CO 4	Apply the mechanics and application of presentation skills and apply people skills in various social organizational and corporate ambiences.									2				
17 EN 32 03	**CORPORATE COMMUNICATION SKILLS**	0-0-4	2	CO 1	Analyse the method of identifying synonyms and antonyms and analyze the meaning of a word from the context.									2				
				CO 2	Analyze various strategies involved in writing an essay and apply various styles in writing.									2				
				CO 3	Analyse the organization of the passage and									2				

					also analyze the tone, attitude and style of the author.													
				CO 4	Acquire knowledge on various employability skills & analyze a situation and develop adaptability.					2								
17 GN 1001	**ECOLOGY AND ENVIRONMENT**	2-0-0	2	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	Apply the environmental science knowledge on solid waste management, disaster management and EIA process.						2							
17 GN 1002	**HUMAN VALUES**	2-0-0	2	CO 1	Understand and identify the basic aspiration of human beings								1					
				CO 2	Envisage the roadmap to fulfill the basic aspiration of human beings.								2					
				CO 3	Analyze the profession and his role in this existence.								2					

17MT1101	**SINGLE VARIABLE CALCULUS AND MATRIX ALGEBRA**			CO 1	Model the physical laws and relations mathematically as a first order differential equations, solve by analytical and numerical methods also interpret the solution.	1													
		3-0-2	4	CO 2	Model physical laws and relations mathematically as a second/higher order differential equation, solve by analytical method and interpret the solution.	1													
				CO 3	Obtain the Fourier series expansions of periodic functions and use the series to solve ordinary differential equations.	1													
				CO 4	Model physical problems mathematically as a system of linear equations and solve them by analytical and numerical methods. Also, determine the nature of Quadratic form using Eigen	1													

					values.														
				CO 5	Verify the solution of problems through MATLAB.					1									
17MT1102	**FOUNDATIONS OF COMPUTATIONAL MATHEMATICS**	3-0-2	4	CO 1	Evaluate mathematical expressions by using different types of operations on numbers.	2													
				CO 2	Simplify expressions and solve equations & inequations.	2													
				CO 3	Apply different types of arithmetic expressions to solve given problems.	2													
				CO 4	Apply methods to find areas , volumes and use graphs to reduce non-linear to linear forms.	2													
17MT1203	**MULTIVARIATE CALCULUS**	3-0-2	4	CO 1	Determine extreme values for functions of several variables	2													
				CO 2	Determine area, volume moment of inertia through multiple integrals in Cartesian or polar co ordinates.	2													

				CO 3	Apply the concepts of vector calculus to calculate the gradient, directional derivative, arc length , areas of surfaces and volume of solids in practical problems	2												
				CO 4	Obtain analytical and numerical solutions of Heat and wave equations	2												
				CO 5	Verify the solution of problems through MATLAB					2								
17 CY 10 01	ENGINEERING CHEMISTRY	3-0-2	4	CO 1	Predict potential complications from combining various chemicals or metals in an engineering setting			2	2									
				CO 2	Discuss fundamental aspects of electrochemistry and materials science relevant to corrosion phenomena			2	2									
				CO 3	Examine water quality and select appropriate purification technique for intended problem			2	2									

				CO 4	Apply polymers, conducting polymers ,green chemistry and nano chemistry to engineering processes			2										
				CO 5	An ability to analyze & generate experimental skills			2	2									
17 PH 10 01	**ENGINEERING MATERIALS**	3-0-2	4	CO 1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.	1												
				CO 2	Understands magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.	1												
				CO 3	Understands thermal and mechanical properties of materials, heat treatment methods for changing the microstructure of materials and	1												

					responses of materials subjected to load.													
				CO 4	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.	1												
				CO 5	Apply the knowledge on structure and properties of materials while executing experiments and develop inter disciplinary projects.				2									
17MT2006	**PROBABILITY AND STOCHASTIC MODELS**	2-2-2	4	CO 1	Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance		2											
				CO 2	Predict the relationship between two variables and construct the linear and non-linear regression lines for the given data		2											
				CO 3	Model the Single and multi server markovian					2								

					queuing models with finite and infinite capacity.													
				CO 4	Verify and validate the simulation models.					2								
				CO 5	Verify the solution of problems through MATLAB/MINI TAB.					2								
17 MT 1204	**LOGIC AND REASONING**	2-0-0	2	CO 1	Apply the fundamental principle of counting and use them to measure the uncertainty in random experiments.	2												
				CO 2	Apply Venn diagrams to find the conclusion of statements , solve puzzles using binary logic and problems relating to cubes.	2												
				CO 3	Apply the available models for Data sufficiency & redundancy and interpret it , when given, in tabular and graphical forms.	2												
				CO 4	Apply the Reasoning techniques to solve problems on arrangements, series, analogies,	2												

					coding and decoding.														
17EM1101	**INTRODUCTION TO ELECTRONICS AND COMPUTER SCIENCE ENGINEERING**	3-0-2	4	CO 1	Discuss the various applications of electronics in everyday lives and Understand the working of basic electronic components	1													
				CO 2	Understand the usage of diodes, LED,LCD ,Sensors in design of electronic applications.	1				1									
				CO 3	Understand the applications of computers in day to day life and various software packages	1				1									
				CO 4	Understand the basics of computer networks ,internet and design web pages using HTML	1				1									
				CO 5	Implement the Basic Components, Sensors and Communication Modules using Arduino and Apply various Software packages to solve real world problem	2				2									
17CS	**PROBLEM**	2-4-2	5	CO 1	Understanding the various steps		1												

1101	**SOLVING AND COMPUTER PROGRAMMING**				in problem solving, Use C-programming control statements and loops.													
				CO2	Apply suitable searching and sorting techniques to solve various problems		2										2	
				CO3	Apply stack and Queue datastructures to solve real world problems		2										2	
				CO4	Apply linked List and tree data structures to solve real world problems		2											
				CO5	Practice all the programs based on searching , sorting stack, Queue, list and tree		2											
17CS1102	**DATA STRUCTURES**	2-4-2	5	CO1	Apply Array, Structure, Queue and Priority Queue concepts for solving problems	2	2											
				CO2	Use linked lists and apply stacks and queue's in different applications	2	2											
				CO3	Apply advanced search techniques, Trees, Binary trees, Expression Trees and Binary Search Trees for	2	2											

					solving problems													
				CO 4	Use RedBlack Tree, for solving problems and apply advanced search techniques like Hashing, Rehashing and Extendible hashing to solve real world problems	2	2											
				CO 5	Practice the programs on Queue, Stack, Tree, and Hashing.	2											2	
17GN1003	**BASIC ENGINEERING MEASUREMENTS**	2-0-2	3	CO 1	Understand the Basic fundamentals of a measurement system.			1										
				CO 2	Understand various Mechanical measuring parameters, and apply different measuring techniques on various mechanical parameters using simulation and experimentation tools.	1	1											
				CO 3	Understand various Electrical measuring parameters, and apply different measuring	1	1											

					techniques on various Electrical parameters using simulation and experimentation tools.													
				CO 4	Understand various Electronic measuring parameters, and apply different measuring techniques on various Electronic parameters using simulation and experimentation tools.	1	1											
				CO 5	Apply the theoretical concepts to measure different parameters.		1											
17 ME 1001	**ENGINEERING MECHANICS**	3-0-2	4	CO 1	Understand the concept of forces and apply the static equilibrium equations.	2	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		2											

					under translation and rotation with and without considering forces.														
				CO 5	Understand and analyze the engineering systems with the help of mechanics concept to solve the engineering problems.				2										
17 ME 1002	**ENGINEERING GRAPHICS**	1-0-4	3	CO 1	Understand the principles of drawing and use of drafting instruments	2								2		2			
				CO 2	Draw engineering curves and scales.	2								2		2			
				CO 3	Draw the projections of points, lines, planes and solids	2								2		2			
				CO 4	Draw the surface sheath of solids by development of surfaces and the sections of Solids.	2								2		2			
				CO 5	Prepare 2D & 3D drawings of solids and their transformations.	2								2		2			
17 ME 1003	**WORKSHOP PRACTICE**	0-0-2	1	CO 1	prepare the different joints using carpentary trade by using wood as raw material					2									
				CO 2	prepare the different fits using fitting					2									

					trade with Ms plates as raw material													
				CO 3	prepare the different components using Tinsmithy trade by using GI sheet as raw material					2								
				CO 4	Apply basic electrical engineering knowledge for house wiring practice.					2								
17 EM 2102	**SIGNALS AND SYSTEMS**	2-2-2	4	CO 1	Understand the representation, manipulation and operations of discrete Time Signals and Systems and illustration of sampling theorem.		1											
				CO 2	Understand the Convolution and frequency domain representation of Z- Transforms and its application to LTI systems		1											
				CO 3	Analyze Discrete Time signals in Fourier and fast Fourier transforms		2											
				CO 4	Realization of Digital Filters: IIR and FIR		2											
				CO 5	Apply and evaluate Signals and systems concept to various applications under time domain and transform domain					3								
17 CS	**OBJECT ORIENT**	2-2-2	4	CO 1	Understand Basic Concepts		2											

2004	**ED PROGRAMMING**				of OOP, introduction to classes and objects through Java Language and apply.														
				CO2	Understand the concepts of constructors, Overloading, parameter passing, access control, Inheritance and apply.		2												
				CO3	Understand Packages, Interfaces, and Exception Handling and apply.		2												
				CO4	Understand I/O Streams & apply and understand Basic Concepts of Multi – Threading					3									
				CO5	Apply OOP concepts for developing an application					3								3	
17CS2005	**DISCRETE MATHEMATICS**	3-1-0	4	CO1	Understand sets, relations, functions and discrete structures , Count discrete event occurrences	2													
				CO2	Apply Propositional logic and First order logic to solve problems	2													
				CO3	Formulate and solve recurrence					2									

					relations, apply algebraic structures and lattices.													
				CO 4	To identify the basic properties of graphs and trees and model simple applications					2								

SYLLABUS

HUMANITIES AND SOCIAL SCIENCES

BUILDING BLOCKS FOR COMMUNICATION SKILLS

Course code: 17 EN 1201 **L-T-P: 0-0-4**
Pre Requisite: NIL **Credits: 2**
Mapping of Course Outcomes (CO) to Student outcomes:

CO No:	CO	PO	BTL
1	Improve pronunciation skills and understand the method of identifying antonyms.	**10**	3
2	Apply writing strategies for office/ formal communication	**10**	3
3	Analyze types of reading techniques and improve reading speed.	**10**	4
4	Analyze different cultures and the importance of empathy in cross-cultural communication.	**8**	4

SYLLABUS

Listening & Speaking Skills: Phonetics symbols- practice- Exercises - Pronunciation- Reading Cum Speaking Practice: Enunciation- Homonyms- Homophones- Homographs: Vocabulary- Root words- Affixes- Identifying meaning from context- Synonyms & Antonyms: Word building: Escatalk**: Speaking** to persuade: Pyramid Discussion**:** Story- Telling and interpretation: End story: Speaking to Explain: Tell me why?

General Writing Skills: Clarity and conciseness in writing: Paragraph Writing: Identifying Topic sentences, writing topic sentence: Linkers, Coordinates: Letter Writing & E- Mail Writing: Netiquette

Reading Skills: Reading comprehension Practice Exercises: Reading for information: Reading for specifics --- theme, attitude: Types of Reading: Vertical Reading: Identifying the central idea**:** Speed Reading --- seven techniques to improve reading speed

Soft Skills: Introduction to soft skills: Verbal and Non-verbal communication: Cultural sensitivity: Empathy and understanding: Diversity and Acculturation

Reference Books

1. English pronunciation in use: Intermediate, 2nd edition, Mark Hancock and Sylvie Donna, Cambridge publication.
2. Speaking English Effective (English) 2nd Edition, Krishna Mohan & N P Singh, Laxmi Publications-New Delhi, 2005 print.
3. The Ace of Soft Skills, Mr. Gopalaswamy Ramesh et al, Pearson publishers, 2010 print.
4. Effective speech, Richard W.Clark, Glencoe Pub. Co., 1988 Print.
5. Effective Business Communication, Asha Kaul, PHI Learning Private Limited, New Delhi, 2011

INSTANT COMMUNICATION SKILLS

Course code: 17 EN 3102 **L-T-P: 0-0-4**

Pre Requisite: NIL **Credits: 2**

Mapping of Course Outcomes (CO) to Student outcomes:

CO No	CO	PO	BTL
CO 1	Analyse the concept of Group Discussion and speak effectively during the discussion.	**10**	**4**
CO 2	Apply and analyze various concepts of writing strategies in professional communication skills like, reports, proposals and minutes of the meeting.	**10**	**3**
CO 3	Analyse vocabulary and apply the types of reasoning in comprehending the information.	**10**	**4**
CO 4	Apply the mechanics and application of presentation skills and apply people skills in various social organizational and corporate ambiences.	**10**	**3**

SYLLABUS

Speaking & Listening Skills: Group Discussions: Know yourself as a Communicator**:** Communicating with others**:** Format of GD as used in national level recruitment boards**:** Rules, ambience and normal practices**:** Do s and Don't s in Group Discussions: Helping to build confidence, improve on content and clarity**:** Practicing skills like Initiating, developing and concluding discussions

Structures and Written Expression: Sentence Completion: Writing Proposals: Product and process description: Agenda, Minutes and Scheduling meetings: Technical Writing Skills: Report Writing: Types of reports, Formats and how to write good reports.

READING SKILLS: Reasoning Skills: Analytical Reasoning: Critical Reasoning: Language Specific Reasoning: Vocabulary in context: Signpost words: Pejorative Signals and Complimentary Signals: Continuation Signals: Contrast signals: Sentence Completion: Text completion: Sentence Equivalence.

SOFT SKILLS: Seminars & Presentations: People Skills: Initiating and ending conversations: Expressing and creating interest: Initiating and ending conversations: Breaking good/bad news

Text Books

1. Professional Communication, Aruna Koneru, Tata Mc Graw- Hill Publishing Company, New Delhi, 2008 Print..

2. Technical Writing Process and Product (third edition), Sharon J. Gerson, Steven M Gerson, Pearson Education, Asia.
3. Developing Reading Skills: A Practical Guide to Reading Comprehension Exercises, Frangoise Grelle. Cambridge University Press, 1981.
4. Study Reading: A Course in Reading Skills for Academic Purposes, Eric H. Glendinning, Beverly Holmström, Cambridge University Press, 2004.
5. Reasoning and Reading Level 1, Joanne Carlisle, School Specialty Intervention, 1999
6. Presentation skills. The essential guide for students, Patsy Mc Carthy & Caroline Hatcher, Sage publications, 2002.
7. Business Communication : Connecting in a Digital World, Raymond V.Leisikar, Marie. E. Flatley et al. Mc Graw Hill Education, 13 Edition, 2015 print.

CORPORATE COMMUNICATION SKILLS

Course code: 17 EN 3203 **L-T-P: 0-0-4**
Pre Requisite: NIL **Credits: 2**
Mapping of Course Outcomes (CO) to Student outcomes:

CO No	CO	PO	BTL
CO 1	Analyse the method of identifying synonyms and antonyms and analyze the meaning of a word from the context.	**10**	4
CO 2	Analyze various strategies involved in writing an essay and apply various styles in writing.	**10**	4
CO 3	Analyse the organization of the passage and also analyze the tone, attitude and style of the author.	**10**	4
CO 4	Acquire knowledge on various employability skills & analyze a situation and develop adaptability.	**5**	4

SYLLABUS

SPEAKING SKILLS: Verbal Ability: Synonyms & Antonyms: Analogy: One word substitution: Sentence completion: Analyzing arguments: Sentence correction: Speaking Practice: Persuasive speaking: Sell out: Impromptu speaking: My News my paper

WRITING SKILLS: Résumé Writing: Five Types of Essays: Agree or disagree: Which do you prefer and why: If / imaginary: Description / Explanation: Comparison and Contrast

Styles in Writing: Modes of Discourse: Narration : Description: Exposition: Argumentation/ Persuasion

READING SKILLS: Reading Comprehension: Critical Reading: Searching for implied meanings: Answering questions on theme, tone, point of view, title etc.

SOFT SKILLS: Interview Skills: Mock Interviews: Writing personal profile & Company profile: Answering unconventional HR questions**:** Dress Code**:** Dining etiquette**:** Interpersonal skills

Text Books

1. Communication Skills, Sanjay Kumar & PushpaLata, Oxford University Press, 2014 print.

2. IELTS Essay Booster (One Stop Destination for the Writing Module) (English), Akanksha Makwana, Heeral Bhatt, MK Book Distributors- Ahmedabad.
3. GRE Analytical Writing : Solutions to the Real Essay Topics (English), Create space Independent Pub
4. Critical Reading: English for Academic Purposes 1st Edition, Pearson Education ESL; 1 edition, 2015
5. Study Reading: A Course in Reading Skills for Academic Purposes, Eric H. Glendinning, Beverly Holmström, Cambridge University Press, 2004.
6. Soft skills enhancing employability – connecting campus with corporate, M S Rao, International Publishing Pvt Ltd, 2002.
7. Personality development and soft skills, Sunitha Mithra, OUP 2012.
8. Objective English : 3 rd Edition, Edgar Thorpe and Showick Thorpe, Pearson Publishers, 2010 print.
9. Objective General English, RS Agarwal, S Chand Publishers, New Delhi.

ECOLOGY AND ENVIRONMENT

Course code: 17 GN 1001 **L-T-P: 2-0-0**
Pre Requisite: NIL **Credits: 2**

Mapping of the course outcomes with student's outcomes.

CO No:	CO	PO	BTL
CO 1	Understand the importance of Environmental education and conservation of natural resources.	6	1
CO 2	Understand the importance of ecosystems and biodiversity.	12	1
CO 3	Apply the environmental science knowledge on solid waste management, disaster management and EIA process.	6	3

Syllabus:

The Multidisciplinary nature of Environmental Studies - Introduction to Environment, Definition,scope,importance,Multidisciplinary nature of Environmental Studies, Need for public awareness. Institutions and people in Environment. **Natural Resources**- Renewable and Non Renewable Resources **Forest resources** - Benifits,Deforestation,causes, effects and impacts, Afforestation programmes, Socio-forestry, Agro-forestry, Vanasamrakshana programmes,. **Mining its impact on environment** - mining, dams and their effects on forests and tribal people. **Water resources**- Distribution of surface and ground water, Aquifers, floods, drought, conflicts over water, dams, benefits and problems, Water conservation, rain water harvesting, watershed management, Cloud seeding **Mineral resources**- Use, exploitation, environmental effects. **Food resources**- Changes in agricultural methodologies, comparison between old and new methods of farming, Green Revolution, Environmental Impact Assessment of conversion of agricultural lands, effects of modern agriculture, Drip Irrigation, fertilizer, pesticide problems, Eutrophication, Vermicompost, water logging, Blue baby syndrome. **Energy resources** - Growing energy needs, renewable and non renewable energy sources. **Land resources**-. **Soil erosion**- Importance of soil, Types of soil erosion, Causes and effects of soil erosion. How to control soil erosion. Role of an individual in conservation of natural resources. **Ecosystems** - Concept of an ecosystem, Structure and function of an ecosystem, Energy flow in the ecosystem ,Ecological succession, Food chains, food webs and ecological pyramids. Types of ecosystem.

Biodiversity and its Conservation- Introduction, Definition, Levels, Values of biodiversity, India as a mega diversity nation. Hotspots of biodiversity. Threats to biodiversity- Endangered and endemic species of India. Conservation of biodiversity- Assessment of Biodiversity and its impact on Environment. **Environnemental Pollution**- Définition, Causes, effects, control measures of Air pollution, Water pollution, oïl pollution, Marine pollution, Noise pollution, Thermal pollution,Nuclear hazards. **Soil waste management**. **Electronic waste management**, **Biomedical waste management -** Role of an individual in prevention of pollution. **Disaster management**–.Climate change, global warming, acid rain, ozone layer depletion. **Environmental Legislation** and objectives of Environment Protection Act, Air (Prevention and Control of Pollution) Act, Water (Prevention and control of Pollution) Act, Wildlife protection Act, Forest conservation Act, Biodiversity Act, Public awareness. **Environmental Impact Assessment Process.**

Text Book:

1. Anubha Kaushik, C.P.Kaushik, "Environmental Studies" , New Age International, (2007).
2. Benny Joseph, "Environmental Studies", Tata McGraw-Hill companies, New Delhi, (2009).

HUMAN VALUES

Course code: 17 GN 1002 **L-T-P: 2-0-0**

Pre Requisite: NIL **Credits: 2**

Mapping of the course outcomes with student's outcomes.

CO No:	CO	PO	BTL
CO1	Understand and identify the basic aspiration of human beings	8	2
CO2	Envisage the roadmap to fulfill the basic aspiration of human beings.	8	4
CO3	Analyze the profession and his role in this existence.	8	4

Syllabus:

Introduction to Value Education: Understanding Value Education, Self-exploration as the Process for Value Education, Continuous Happiness and Prosperity - The Basic Human Aspirations, Right Understanding, Relationship and Physical Facilities, Happiness and Prosperity – Current Scenario, Method to fulfill the Basic Human Aspirations.

Harmony in the Human Being: Understanding the Human Being as Co-existence of Self ('I') and Body, Discriminating between the Needs of the Self and the Body, The Body as an Instrument of 'I', Understand Harmony in the Self ('I'), Harmony of the Self ('I') with the Body, Program to Ensure Sanyam and Svasthya.

Harmony in the Family and Society: Harmony in the Family - the Basic Unit of Human Interaction, Values in Human-to-Human Relationships, 'Trust' – the Foundational Value in Relationships, 'Respect' – as the Right Evaluation, Understand Harmony in the Society, Vision for the Universal Human Order.

Harmony in the Nature (Existence): Understand Harmony in the Nature, Interconnectedness, Self-regulation and Mutual Fulfillment among the Four Orders of Nature, Realizing 'Existence is Co-existence' at All Levels, The Holistic Perception of Harmony in Existence.

Implications of the Right Understanding – a Look at Professional Ethics: Natural Acceptance of Human Values, Definitiveness of (Ethical) Human Conduct, A Basis for Humanistic Education, Humanistic Constitution and Universal Human Order, Competence in

Professional Ethics, Holistic Technologies, Production Systems and Management Models - Typical Case Studies, Strategies for Transition towards Value-based Life and Profession.

Text Book:

1. R R Gaur, R Sangal and G P Bagaria, " A Foundation Course in Human Values and Professional Ethics", 1st Ed, Excel Books.

BASIC SCIENCES

SINGLE VARIABLE CALCULUS AND MATRIX ALGEBRA

Course code: 17 MT 1101 **L-T-P:** 3-0-2

Pre Requisite: NIL **Credits: 4**

Mapping of Course Outcomes (CO) to Student outcomes:

CO No:	Course out come	PO	BTL
1	Model the physical laws and relations mathematically as a first order differential equations, solve by analytical and numerical methods also interpret the solution.	1	1
2	Model physical laws and relations mathematically as a second/higher order differential equations, solve by analytical method and interpret the solution.	1	2
3	Obtain the Fourier series expansions of periodic functions and use the series to solve ordinary differential equations.	1	2
4	Model physical problems mathematically as a system of linear equations and solve them by analytical and numerical methods. Also, determine the nature of Quadratic form using Eigen values.	1	1
5	Verify the solution of problems through MATLAB.	5	2

SYLLABUS :

Differential Equations: Definitions and terminology and mathematical models used in differential equations. First-order and higher-order differential equations, along with the methods of solutions and their applications. Modeling with first and higher-order also systems of linear first-order differential equations. Solutions of first order ordinary differential equations by Numerical methods.

Fourier series: Definitions and Fourier series for a periodic signal. Fourier series for simple functions. Fourier series of the summation of sinusoids directly from the definition by using Euler's formula. Solving particular solution to differential equation by Fourier series.

Matrix algebra: Solving linear System of equations by Gauss-elimination, L U decomposition and Jacobi, Gauss Seidal iteration methods, orthogonal, symmetric, skew-symmetric, Hermitian, Skew-Hermitian and unitary matrices, Eigen values, Eigen vectors and their properties, Cayley - Hamilton theorem (without proof) and its applications, and quadratic forms.

Text books:

1. Advanced Engineering Mathematics, Erwin Kreyszig. John Wiley & Sons, Inc. 10 th Edition.
2. Advanced Engineering Mathematics, Greenberg, PHI Publishers, 2nd Edition.

Reference Books:

1. Differential Equations for Engineers, Wei-Chau Xie, Cambridge University Press, New York. R1

2. Higher Engineering Mathematics, BS Grewal. Publisher: Khanna, New Delhi. R2
3. Advanced Numerical Methods with MATLAB, SC Chapra, Tata McGraw-Hill. R3

FOUNDATIONS OF COMPUTATIONAL MATHEMATICS

Course code: 17 MT 1102 **L-T-P:** 3-0-0
Pre Requisite: NIL **Credits: 3**
Mapping of Course Outcomes (CO) to Student outcomes:

CO No	Course out come	PO	BTL
1	Evaluate mathematical expressions by using different types of operations on numbers.	**1**	**3**
2	Simplify expressions and solve equations & inequations.	**1**	**3**
3	Apply different types of arithmetic expressions to solve given problems.	**1**	**3**
4	Apply methods to find areas , volumes and use graphs to reduce non-linear to linear forms.	**1**	**3**

Numbers : Bodmas Rule, Fractions & Decimals, Classification of numbers, Divisibility rules, factorization, Division & Successive division, Remainders in divisions involving higher powers, LCM and HCF and Number systems.

Algebra: Powers, roots and Indices, Venn diagrams, Surds, Logarithms, Quadratic Equations & Inequalities, Progressions, Simple Equations. Transposing formulae and solving simultaneous equations.

Arithmetic : Ratios, Proportion, Variation, Percentages, Profit & Loss, Simple & Compound Interest, Averages, Mixtures and Allegations, Time and Distance, Time and Work, Clocks, Calendars and Blood relations

Geometry and Mensuration: Lines & angles, triangles, quadrilaterals, polygons, circles, surface areas, volumes of 3D figures, graphs reducing non-linear laws to linear form and graphs of exponential functions.

Prescribed Text Books

1. Basic Engineering Mathematics**,** John Bird, Fourth Edition, Elsevier.

Reference Text Books

1. Quantitative Aptitude, R. S. Aggarwal, Schand Publications.
2. Quantitative Aptitude - G. L. Barrons.
3. Quantitative Aptitude - Abhijit Guha, Mc Graw Hills.

MULTIVARIATE CALCULUS

Course code: 17 MT 1203 **L-T-P:** 3-0-2
Pre Requisite: NIL **Credits: 4**
Mapping of Course Outcomes (CO) to Student outcomes:

CO No:	Course Outcome	PO	BTL
1	Determine extreme values for functions of several variables	**1**	**3**
2	Determine area, volume moment of inertia through multiple integrals in Cartesian or polar co ordinates.	**1**	**3**
3	Apply the concepts of vector calculus to calculate the gradient, directional	**1**	**4**

	derivative, arc length , areas of surfaces and volume of solids in practical problems		
4	Obtain analytical and numerical solutions of Heat and wave equations	**1**	**4**
5	Verify the solution of problems through MATLAB	**5**	**3**

SYLLABUS:

Differential Calculus: Partial derivatives, Jacobian, total differentiation and their applications, chain rule, Taylor's series for function of two variables, maxima and minima of functions of two variables, Lagrange's multipliers method.

Integral Calculus: Line integrals- double and triple integrals and applications to area, volume, mass & moment of inertia. Change of order of integration, change of variables in polar, cylindrical and spherical polar coordinates.

Vector Calculus: Scalar and vector point functions, gradient and directional derivative of a scalar point function, divergence and curl of a vector point function. Line, surface and volume integrals, Green's, Gauss divergence and Stoke's theorems and their applications

Partial differential equations: Formation of partial differential equations, solutions of first order linear and nonlinear PDEs by Lagrange method, solution of second order PDEs by method of separation of variables i.e., one dimensional wave and heat equations, Laplace equation in two dimensions. Solving Laplace equation by Finite difference method.

Text books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, 10 th Edition, John Wiley &Sons, Inc, Newyork . (2015)
2. Nakhle H Asmar, Partial differential equations with Fourier series and boundary value problems, Second edition Pearson Pub.

Reference Books:

1. Michael Greenberg, Advanced Engineering Mathematics. Second edition, Prentice **Hall, USA.**
2. Zafar Ahsan, Differential equations and their applications, second edition, PHI
3. Higher Engineering Mathematics, B.S.Grewal, Khanna Publishers, India

ENGINEERING CHEMISTRY

Course code: 17 CY 1001 **L-T-P: 3-0-2**

Pre Requisite: NIL **Credits: 4**

Mapping of Course Outcomes (CO) to Student outcomes:

CO No:	Course Outcome	PO	BTL
1	Predict potential complications from combining various chemicals or metals in an engineering setting	**4,3**	**3**
2	Discuss fundamental aspects of electrochemistry and materials science	**4,3**	**3**
3	Examine water quality and select appropriate purification technique for	**4,3**	**4**
4	Apply polymers, conducting polymers ,green chemistry and nano chemistry	**3**	**4**
5	An ability to analyze & generate experimental skills	**4,3**	**4**

SYLLABUS:

ELECTRO CHEMISTRY: Single electrode potential and its measurement, Electrochemical cells, EMF series, Nernst equation, Cell emf measurement, Reversible and irreversible cells, Concentration cells, Reference electrodes--Determination of pH using glass electrode. **Storage devices :** Chemistry, construction and engineering aspects of Primary (mercury battery) and

secondary (lead-Acid cell, Ni-Metal hydride cell, Lithium cells) and fuel cells– Hydrogen–Oxygen fuel cell, advantages of fuel cell. , **Fuels –** Types of fuels, Calorific value, Determination of Calorific value; **CORROSION & ITS CONTROL:**Causes and different types of corrosion and effects of corrosion. Theories of corrosion– Chemical, Electrochemical corrosion, Pitting corrosion, stress corrosion, Galvanic corrosion. Factors affecting corrosion– Nature of metal, galvanic series, over voltage, purity of metal, nature of oxide film, nature of corrosion product. Nature of environment- effect of temperature, effect of pH, Humidity, effect of oxidant. Cathodic protection, sacrificial anode, impressed current cathode, electroplating; **METAL ALLOYS:** Types of Alloys- ferrous and nonferrous alloys, Carbon steel, Alloy steel, Alloys of Cu, Al, Pb.**PHASE RULE:** phase rule applications to one and multiple component systems phase diagram. **WATER Technology**: Introduction, Hardness: Causes, expression of hardness – units – types of hardness, estimation of temporary and permanent hardness of water, numerical problems. Alkalinity and estimation of alkalinity of water, numerical problems. **Boiler troubles** – Scale & sludge formation, caustic embrittlement, Boiler corrosion, priming & foaming. **Softening of water**: Internal and external treatments -Lime soda, Ion exchange process. **Desalination-**reverse osmosis and electro dialysis.**POLYMERS AND PLASTICS: Basic concepts of polymers-** Types of polymerization-Plastics – Thermoplastic resins and Thermosetting resins - Compounding of plastics – Fabrication of plastics. Preparation, properties and engineering applications of: polyethylene, PVC, Teflon, Bakelite, Urea Formaldehyde. **Conducting Polymers**: Polyacetylene,polyaniline, conduction, doping and applications. **Polymer composites:** Physico Chemical properties of polymer composites and Applications.**NANO TECHNOLOGY:** Introduction, Fullerenes, Carbon nanotubes, Nanowires; properties; Synthesis of nanomaterials; Topdown & bottom up approach; Applications of nanomaterials.**GREEN CHEMISTRY: Introduction,** Green technology- Latest green laboratory technology for saving experimental resources and infrastructural framework; R4M4 (Reduce, Reuse, Recycle, Redesign; Multipurpose, Multidimensional, Multitasking, Multi-tracking;) model with special reference of survismeter, econoburette.

Text books:

1. Engineering Chemistry, Jain & Jain, Dhanpat Rai Publishing Company. New Delhi.
2. Engineering Chemistry, O G Palanna, The Tata McGraw Hill, New Delhi.

Reference Books:

1. Chemistry in Engineering and Technology, Volume 2, J C Kuriacose & J Rajaram, Tata McGraw Hill, New Delhi.
2. Chemistry for Engineers,Dr Rajesh Agnihotri, Wiley, New Delhi.
3. Engineering Chemistry, B. Sivasankar, The Tata McGraw Hill, New Delhi.
4. A text book of Engineering Chemistry, Shashi Chawla, Dhanpat Rai & Co. New Delhi.
5. Engineering Chemistry, C Parameswara Murthy, C V Agarwal and Andra Naidu, B S Publications, Hyderabad.
6. Engineering Chemistry, Shikha Agarwal, Cambridge University Press.

ENGINEERING MATERIALS

Course code: 17 PH 1001 **L-T-P:** 3-0-2

Pre Requisite: NIL **Credits: 4**

Mapping of Course Outcomes (CO) to Student outcomes:

CO No:	Course Outcome(CO)	PO	BTL

1	Understands structure of crystalline solids, kinds of crystal imperfections and appreciates structure-property relationship in crystals.	**1**	2
2	Understands magnetic properties of materials and identifies their role in classification soft & hard magnetic materials having specific engineering applications.	**1**	2
3	Understands thermal and mechanical properties of materials, heat treatment methods for changing the microstructure of materials and responses of materials subjected to load.	**1**	2
4	Understands the role of electronic energy band structures of solids in governing various electrical and optical properties of materials.	**1**	2
5	Apply the knowledge on structure and properties of materials while executing experiments and develop inter disciplinary projects.	**4**	3

SYLLABUS

Crystallography: Bonding in materials, Space lattice, basis, unit cell, Seven Crystal systems, Bravais lattice system, Reciprocal lattice, Crystal directions, Miller Indices, problems, Diffraction of Crystals, Bragg's Law, XRD, Laue, Rotating Crystal and powder XRD Techniques, Problems.

Crystal Imperfections: Point Defects, Line Defects, Surface Defects, Volume Defects, and Effects of Defects on Crystalline Properties.

Magnetic properties: Origin of Magnetic Moment, Dia, Para, Ferro, Antiferro and Ferri Magnetism, Domain theory and Hysteresis Effect of Ferro and Ferri Magnetism, Soft and Hard Magnetic Materials.

Thermal properties: Iron-Carbon Diagram, Heat capacity, Thermal Expansion and Thermal Conductivity in Metals, Ceramics and Polymers, Heat treatment of Materials, Hardening, Tempering, Quenching and Nitriding.

Mechanical Properties: Stress, Strain, Hooke's Law, Elasticity, Plasticity, Creep, Ductility, Brittle, Hardness, Strength, Modulus of Elasticity, Fracture, Fatigue, Stress- Strain Behavior of Ductile and Brittle Materials, Hardness Tests- Vickers, Rockwell and Brinell.

Electrical Properties: Energy band theory, Band structures in Conductors, Semi conductors and Insulators, Electrical properties of conductors- Ohms, Mathiessen rule, conductivity, Mobility, Electrical properties of Semi conductors, Factors effecting the carrier concentration, Conductivity and Mobility of charge carriers. Electric properties of Insulator-Dielectrics- Types of Dielectrics, Dielectric Constant, Polarization, Types of Polarizations, Frequency Dependence of Polarization, Ferro, Piezo Electrics.

Optical properties: Optical reflectance, Optical Absorption, snell's law, Total Internal reflection in optical fibers.

Text books:

1. William D. Callister,Jr. "Materials Science and Engineering: An Introduction" 6th edition, 2007, Wiley India Pvt.Ltd.
2. Charles Kittel, " Introduction to Solid State Physics" 8th edition, 2012, Wiley India Pvt.Ltd.

Reference Books:

1. Adrianus J. Dekker, "*Solid State Physics"* 1st Edition *2002,* Macmillan India Ltd.
2. S. O. Pillai, "Solid state physics" Revised 6th edition, New Age International Publishers.
3. Rangwala, Engineering Materials (Material Science)**,** Charotar Publishing House PVT. LTD.

PROBABILITY AND STOCHASTIC MODELS

Course Code :17MT2006 L-T-P :3-0-2

Pre-requisite :NIL Credits : 4

Mapping of course outcomes with student outcomes:

CO.No	Course outcome	Mapped PO	BTL
1	Construct the probability distribution of a random variable, based on a real-world situation, and use it to compute expectation and variance	**2**	**4**
2	Predict the relationship between two variables and construct the linear and non-linear regression lines for the given data	**2**	**4**
3	Model the Single and multi server markovian queuing models with finite and infinite capacity.	**5**	**4**
4	Verify and validate the simulation models.	**5**	4
5	Verify the solution of problems through MATLAB/MINITAB.	**5**	**4**

Syllabus:

Probability and Random variables: Definitions of probability, Sample space, Axioms of probability, Conditional probability, Addition, Multiplication and Bayes' theorem. Random variables, Joint and marginal probabilities, Mathematical expectation.

Standard discrete and continuous distributions: Definitions and simple properties of Binomial, Poisson, Geometric, Hyper-Geometric, Uniform, Exponential, Weibull and Normal distributions, Applications of the above distributions.

Correlation and Regression: Correlation coefficient for grouped and ungrouped data, Rank correlation. Linear and Non-Linear Regression.

Stochastic Processes: Discrete-Time Markov Chains, Continuous- Time Markov Chains.

Queueing models: Single and multi server markovian queuing models with finite and infinite capacity. Networks of queues.

Simulation: Introduction to simulation, simulation examples, general principles, statistical models in simulation. Verification and validation of simulation models.

Text Books

1. Ronald E. Walpole, Sharon L. Myers and Keying Ye, "Probability and Statistics for Engineers and Scientists", 8th Edition, Pearson.
2. Kishore S Trivedi, "Probability& Statistics with Reliability, Queueing and Computer Science Applications", 2nd Edition, Wiley India, 2009.

Reference Books

1. Richard A Johnson , Miller & Freund's Probability and Statistics for Engineers, 11th Edition PHI, New Delhi.
2. Jerry Banks, John S Carson, Barry L Nelson, David M Nicol, Discrete- Event System Simulation, 4th Edition, Pearson
3. Jay L. Devore, Probability and Statistics for Engineers, CENAGE learning.
4. S C Gupta and V K Kapoor , Fundamentals of Mathematical Statistics, 11th Edition, S Chand & Sons, New Delhi.

LOGIC AND REASONING

Course code: 17 MT 1204 **L-T-P:** 3-0-0

Pre Requisite: NIL **Credits: 3**

Mapping of Course Outcomes (CO) to Student outcomes:

CO No	Course Outcome (CO)	PO	BTL
1	Apply the fundamental principle of counting and use them to measure the uncertainty in random experiments.	**1**	3
2	Apply Venn diagrams to find the conclusion of statements , solve puzzles using binary logic and problems relating to cubes.	**1**	3
3	Apply the available models for Data sufficiency & redundancy and interpret it , when given, in tabular and graphical forms.	**1**	3
4	Apply the Reasoning techniques to solve problems on arrangements, series, analogies, coding and decoding.	**1**	3

SYLLABUS

Permutation and Combinations : Fundamental Principle of Counting, Counting Methods, Definition of permutation, Linear Permutations, Rank of a word, Circular Permutations, Definition of Combinations, Problems on Combinations

Probability: Definitions of Probability, Addition and Multiplication Theorems.

Deductions: Introduction, Expressing different types of statements using venn diagrams, Definition of complimentary pairs, Finding the conclusions using venn diagrams for two and more statements.

Logical Connectives: Definition of simple statement, Definition of compound statement, Finding the implications for compound statements, Finding the negations for compound statements. **Binary Logic:** Definition of a truth-teller, Definition of a liar, Definition of an alternator, Solving problems using method of assumptions, Solving analytical puzzles using binary logic. **Cubes:** Basics of a cube, Finding the minimum number of cuts when the number of identical pieces are given, Finding the maximum number of pieces when cuts are given, Problems on painted cubes of same and different colors, Problems on cuboids, Problems on painted cuboids, Problems on Dice. **Data Sufficiency:** Different models in Data Sufficiency, Problems on Data sufficiency, Problems on data redundancy. **Data Interpretation :** Problems on tabular form, Problems on Line Graphs, Problems on Bar Graphs, Problems on Pie Charts. **Analytical Reasoning puzzles:** Problems on Linear arrangement, Problems on Circular arrangement, Problems on Double line-up, Problems on Selections, Problems on Comparisons. **Number and letter series:** Difference series, Product series, Squares series, Cubes series, Alternate series, Combination series, Miscellaneous series, Place values of letters. **Number and Letter Analogies:** Definition of Analogy, Problems on number analogy, Problems on letter analogy, Problems on verbal analogy.

Odd man out: Problems on number Odd man out, Problems on letter Odd man out, Problems on verbal Odd man out. **Coding and decoding:** Coding using same set of letters, Coding using different set of letters, Coding into a number .Comparison & Elimination

Text Books

1. A modern approach to Logical reasoning, R S Agarwal, S. Chand Publications.

Reference Text Books

1. Logical Reasoning, Arun Sharma, Mc Graw Hill.
2. Analytical & Logical Reasoning, Peeyush Bhardwaj, Arihant Publications.

ENGINEERING SCIENCES

INTRODUCTION TO ELECTRONICS AND COMPUTER SCIENCE ENGINEERING

Course code: 17EM1101 **L-T-P:** 2-0-2
Pre Requisite: NIL **Credits: 3**
Mapping of Course Outcomes (CO) to Student outcomes:

CO No:	CO	Mapped PO/PSO	BTL
1	Discuss the various applications of electronics in everyday lives and Understand the working of basic electronic components	PO1	1
2	Understand the usage of diodes, LED,LCD ,Sensors in design of electronic applications.	PO1,PO5	1
3	Understand the applications of computers in day to day life and various software packages	PO1,PO5	1
4	Understand the basics of computer networks ,internet and design web pages using HTML	PO1,PO5	1
5	Implement the Basic Components, Sensors and Communication Modules using Arduino and Apply various Software packages to solve real world problem	PO1,PO5	3

Syllabus

Introduction to Electronics Engineering: Day-to-day usage of electronics. Basic Components, Capacitor & types: ceramic, electrolytic, file. Inductor & types: air, iron, trapped. Resistor & types: carbon, ceramic, wire wound, LDR. Carbon resistor color code, RF inductor color code. Thermistor vs Sensistor. Switch & types. Diodes: switching, signal, photodiode, LED. LED types: visible, IR. Common anode & cathode, patterns with LEDs, interfacing with LEDs, usage in daily life. Relay & types: FMR, SSR, usage in daily life. LCDs, usage in daily life. Temperature sensor & calibration, Microphone as a sensor. Gas sensor, calibration & response. LDR & its usage in daily life. LDR as a sensor. Introduction to Computer Engineering: Classification, History, Types of Computers. Block Diagram of The Computer System. Hardware: CPU, Memory, Input and Output devices, Auxiliary storage devices. Software: System and Application Software, Utility packages, Configuration of Computer System. Operating System, Programming Languages, Features and trends. Introduction to Algorithm & flowchart. Office Automation Tools: MS-Office, Word, PowerPoint, Excel. Translators: Assembler, Compiler and Interpreter. Computer Networks, Internet and World Wide Web, FTP, Electronic Mail. Web Development Using HTML.

List of Experiments

1. Write a program to demonstrate LED interfacing using Arduino UNO.
2. Write a program to demonstrate switch LED interfacing Arduino UNO.
3. Write a program to demonstrate 7-Segment interfacing Arduino UNO.
4. Write a program to demonstrate LCD interfacing Arduino UNO.
5. Write a program to demonstrate DC MOTOR interfacing Arduino UNO.
6. Write a program to demonstrate LM35 interfacing Arduino UNO.
7. Write a program to demonstrate RELAY interfacing Arduino UNO.
8. List the Computer System /Laptop Specifications including

a)Processor b) Speed c) RAM d) OS & Version e) Disk Space –Divisions, Occupied ,Free space f) Processor Bit Length g) List of Major software's installed and their usage h) I/O Devices i) List of Browsers j) Ports k) IP Address

9. Mail Merge Using Microsoft Word with necessary Alignments (Font Style, Line Spacing, Margins, Header, Footer).
10. a) Calculate Employee Net Salary Using formulas in Microsoft Excel
    b) Represent the Above data using Graphs (Bar chart/Pie Chart).
11. Create a presentation on any Technical Topic of your choice
12. Create a HTML Static Web page about Yourself including Your Name, Photograph, Address,
    Hobbies and Education Details.

Text Books:

1. Raja Raman V., "Fundamental of Computers" (4th edition.), PHI, New Delhi.
2. Norton, Peter, ―Introduction to Computers, Mc-Graw-Hill.
3. S.Jaiswal, ―Fundamental of Computer & IT□, Wiley dreamtech. India

PROBLEM SOLVING AND COMPUTER PROGRAMMING

Course code: 17CS1101 **L-T-P:** 2-4-2
Pre Requisite: NIL **Credits: 5**
Mapping of Course Outcomes (CO) to Student outcomes:

CO.NO.	Course outcome's	Mapped PO/PSO	BTL
CO1	Understanding the various steps in problem solving, Use C-programming control statements and loops.	2	1
CO2	Apply suitable searching and sorting techniques to solve various problems	2/1	3
CO3	Apply stack and Queue datastructures to solve real world problems	2/1	3
CO4	Apply linked List and tree data structures to solve real world problems	2	4
CO5	Practice all the programs based on searching , sorting stack, Queue, list and tree	2	4

SYLLABUS

Problem Solving Approach, **Algorithms and Algorithm Analysis**, Program Development Steps, Structure of C Program, Pre-Processor Directives, **Formatted I/O**,**C Tokens, Data Types**: Primitive, Extended and Derived Including Pointers, Operators, Precedence, Associativity , **Redirecting I/O** :Files and File Operations , **Control Flow Statements, Functions, Recursion**, Scope of Variables and Storage classes, **Arrays,** 2-DimensionalArrays,Dynamic Memory Allocation, **Searching:** Linear Search and Binary Search, **Sorting:** Bubble Sort, **Strings**, **Structures and Unions**, Introduction to **Stacks**-Implementation using array, Introduction to Queues - Linear **Queue**-Implementation using array, Introduction to **Lists:** Single Linked List- Insertion, Deletion, Display, Introduction to **Trees**- Binary tree, Definition, Terminology.

Text Books:

1. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language: ANSI C Version", 2/e, Prentice-Hall/Pearson Education-2005.
2. E. Balagurusamy , **"**Programming in ANSI C" 4th ed., Tata McGraw-Hill Education, 2008
3. R. F. Gilberg, B. A. Forouzan, "Data Structures", 2nd Edition, Thomson India Edition-2005.

Reference Books:-

1. Mark Allen weiss, Data Structures and Algorithm Analysis in C, 2008, Third Edition, Pearson Education.
2. Horowitz, Sahni, Anderson Freed, "Fundamentals of Datastructures in C", 2nd Edition-2007.
3. Robert Kruse, C. L. Tondo, Bruce Leung, Shashi Mogalla, "Data structures and Program Design in C", 4th Edition-2007.
4. C for Engineers and Scientists – An Interpretive Approach by Harry H. Cheng, Mc Graw Hill International Edition-2010.
5. Jeri R. Hanly, Elliot B. Koffman, "Problem Solving and Program Design in C", 7/e, Pearson Education-2004.
6. Jean Paul Trembly Paul G.Sorenson, "An Introduction To Data Structures with applications", 2nd Edition.

DATA STRUCTURES

Course code: 17CS1102 **L-T-P:** 2-4-2

Pre Requisite: NIL **Credits: 5**

Mapping of Course Outcomes (CO) to Student outcomes:

CO.NO.	Course outcome's	Mapped PO/PSO	BTL
CO1	Apply Array, Structure, Queue and Priority Queue concepts for solving problems	**1,2**	**3**
CO2	Use linked lists and apply stacks and queue's in different applications	**1,2**	**3**
CO3	Apply advanced search techniques, Trees, Binary trees, Expression Trees and Binary Search Trees for solving problems	**1,2**	**3**
CO4	Use RedBlack Tree, for solving problems and apply advanced search techniques like Hashing, Rehashing and Extendible hashing to solve real world problems	**1,2**	**4**
CO5	Practice the programs on Queue, Stack, Tree, and Hashing.	**1/1**	**4**

SYLLABUS

Problem solving on **Arrays**, Array of **Structures**, Nested Structures, **Queues**: DE Queue,Circular Queue and Priority Queues, **Lists:** Operations on Single Linked List, Double Linked List - Operations on DLL, **Problem Solving on Strings**, Circular Linked List, **Applications** of Stacks and Queues, Implementation of Stacks and Queues using Linked List, Constructing **Recursion**, **Heaps**, **Sorting:** Merge Sort, Quick Sort, Heap Sort, Insertion Sort and Shell Sort, **Trees:** Binary Tree, Expression Tree, Binary Search Tree: Implementation- Insertion, Deletion, Tree Traversals, AVL Tree and Splay Tree , **Hashing**: Hash Function, Separate Chaining, Open Addressing, Re-Hashing and Extendible Hashing.

Text Books:

1. Brian W. Kernighan, Dennis M. Ritchie, "The C Programming Language: ANSI C Version", 2/e, Prentice-Hall/Pearson Education-2005.
2. R. F. Gilberg, B. A. Forouzan, "Data Structures", 2nd Edition, Thomson India Edition-2005.
3. Mark Allen weiss, Data Structures and Algorithm Analysis in C, 2008, Third Edition, Pearson Education.

Reference Books:-

1. Horowitz, Sahni, Anderson Freed, "Fundamentals of Datastructures in C", 2nd Edition-2007.
2. Robert Kruse, C. L. Tondo, Bruce Leung, Shashi Mogalla, "Data structures and Program Design in C", 4th Edition-2007.
3. C for Engineers and Scientists – An Interpretive Approach by Harry H. Cheng, Mc Graw Hill International Edition-2010.
4. Jeri R. Hanly, Elliot B. Koffman, "Problem Solving and Program Design in C", 7/e, Pearson Education-2004.
5. Jean Paul Trembly Paul G.Sorenson, "An Introduction To Data Structures with applications", 2nd Edition.

BASIC ENGINEERING MEASUREMENTS

Course code: 17 GN 1003 **L-T-P:** 2-0-2

Pre Requisite: NIL **Credits:** 3

Mapping of Course Outcomes (CO) to Student outcomes:

CO No:	CO	SO	BT L
1	Understand the Basic fundamentals of a measurement system.	c	2
2	Understand various Mechanical measuring parameters, and apply different measuring techniques on various mechanical parameters using simulation and experimentation tools.	a,b	2
3	Understand various Electrical measuring parameters, and apply different measuring techniques on various Electrical parameters using simulation and experimentation tools.	a,b	2
4	Understand various Electronic measuring parameters, and apply different measuring techniques on various Electronic parameters using simulation and experimentation tools.	a,b	2
5	Apply the theoretical concepts to measure different parameters.	b	2

SYLLABUS:

Basic Fundamental Measuring Units: Definition and representation of Displacement(Linear/Angular), Time, Temperature. Speed, Humidity. **Measurement of Mechanical parameters:** Force, Stress, Strain, Pressure, Velocity, Acceleration, Mass and Weight. **Measurement of Electrical parameters:** Current, Voltage, Power, Energy, Power factor, Resistance, Inductance, Capacitance. **Measurement of Electronic parameters:** Oscilloscope : Amplitude, Frequency, Time period, Phase.

LIST OF EXPERIMENTS:

1. Measurement of Linear displacement using LVDT.
2. Measurement of Strain using Strain Gauge Bridge.

3. Measurement of Voltage using MyDAQ.
4. Measurement of Current using MyDAQ.
5. Measurement of Signal parameters (Amplitude, Time period and Frequency) using DSO.
6. Measurement of Unknown resistance using Wheatstone bridge.
7. Measurement of 1 phase Power, Energy of a R-L load.
8. Measurements of Inductance using Anderson Bridge.
9. Measurement of capacitance using Schering's Bridge
10. Measurement of Angular Displacement using Potentiometer.
11. Calibration of Pressure gauge using Dead Weight Pressure Tester.
12. Characterization of Temperature Sensor (RTD,TC,Thermistor).

Text books & References:

1. Experimental methods for engineers, JP Holman, McGraw Hill Ltd.
2. Mechanical measurements, 6/E, Thomas G Beckwith, Pearson
3. Electrical measurements, Martin U Reissland, New Age Int.
4. A course in Electrical, Electronic Measurement, AK Sawhney , Dhanpat Rai & Co.

ENGINEERING MECHANICS

Course Code: 17 ME 1001 **L-T-P:** 3-0-2
Prerequisite: NILL **Credits:** 4

Mapping of Course Outcomes (CO) to Student outcomes:

CO No:	Course Outcome	PO	BTL
1	Understand the concept of forces and apply the static equilibrium equations.	**1,2**	**3**
2	Analyze co-planar and non co-planar system of forces.	**1,2**	**3**
3	Apply the concept of centroid & centre of gravity to determine moment of inertia.	**1,2**	**4**
4	Analyze the rigid bodies under translation and rotation with and without considering forces.	**2**	**3**
5	Understand and analyze the engineering systems with the help of mechanics concept to solve the engineering problems.	**4**	**4**

Syllabus:

Statics: **Two Dimensional Force systems**- Introduction, Basic concepts, Laws of motion, Principle of Transmissibility of forces, Resultant of a force system, force laws, Resultant of two dimensional concurrent and Non-concurrent Force systems, Free body diagrams, Applications. **Equilibrium of Rigid bodies–**Equilibrium and Equations of Equilibrium, Lame's theorem,Type of supports and their reactions**,** Moments and couples, Varignon's theorem, Resultant moment and applications.

Spatial Force Systems and Trusses : Spatial force systems – Forces in space, resultant and equilibrium of spatial force system. **Truss Analysis**-Trusses-Assumptions involved in the Method of joints and sections.

Friction And Properties of Areas : Friction: Introduction, Laws of Coulomb Friction, Equilibrium of Bodies involving Dry-friction, Applications-ladder friction, wedge friction.

Centriod and Moment of Inertia: Centroids, centre of gravity, Moment of inertia- Area and Mass- polar moment of inertia, Parallel axis theorem.

Dynamics : Kinematics of Rigid Body: Introduction, Plane Motion of Rigid Body, Velocity and Acceleration under Translation and Rotational motion.**Kinetics of Rigid Body:** Introduction, Force, Mass and Acceleration, Work and Energy, Impulse and Momentum, D'Alembert's Principles and Dynamic Equilibrium.

List of Experiments

1. Calculation of Moment of Force using weight balancing technique.
2. Determination of angle of deflection due to eccentric loading on T bar
3. Determination of Centroid for Plane laminas of straight edges
4. Determination of Centroid for Plane laminas of curved edges
5. Determination of axial forces in Trapezoidal Truss
6. Determination of axial forces in Triangular Truss
7. Understanding vectors and vector quantities
8. Calculation of Moment of Force using weight balancing technique and system of pulleys.
9. Verification of Lamie's Theorem
10. Determination of coefficient of static friction between two surfaces.
11. Determination of motion parameters using work-energy principle
12. Determination of moment of inertia of a flywheel.

Text Books:

1. Engineering Mechanics (in SI Units) / S. Timoshenko, D. H. Young, J.V. Rao/ Tata McGraw Hill.

References:

1. Engineering Mechanics / S. S. Bhavikatti/ New Age.
2. Vector Mechanics for Engineers -Statics &Dynamics / F.P. Beer and E.R. Johnston/ Tata McGraw Hill.
3. Engineering Mechanics-Statics and Dynamics by R. C. Hibbler, Prentice.
4. Engineering Mechanics- NH Dubey/ New Age

ENGINEERING GRAPHICS

Course Code: 17 ME 1002 L-T-P: 1-0-4

Prerequisite: Nil Credits: 3

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	PO	B T L
1	Understand the principles of drawing and use of drafting instruments	**1,10,12**	4
2	Draw engineering curves and scales.	**1,10,12**	4
3	Draw the projections of points, lines, planes and solids	**1,10,12**	3
4	Draw the surface sheath of solids by development of surfaces and the sections of Solids.	**1,10,12**	3
5	Prepare 2D & 3D drawings of solids and their transformations.	**1,10,12**	3

SYLLABUS

Introduction to Engineering Drawing: Principles of Engineering Graphics and their Significance- Drawing Instruments and their Use - Conventions in Drawing -Lettering - BIS Conventions. **Geometrical Constructions**-Divion of Lines, Angles, Polygons **Engineering Curves used in Engineering Practice & their Constructions**: **Conic Sections**: Ellipse, Parabola, Hyperbola and Rectangular Hyperbola – Gneral and other methods. **Special Curves**:

Cycloid, Epicycloid, Hypocycloid and Involute. **Scale**s: Different types of Scales, Plane scales comparative scales, scales of chords. **Orthographic Projection In First Angle Projection**: Principles of Orthographic Projections - Conventions - First and Third Angle, Projections of Points and Lines inclined to both planes, True lengths, traces. **Projections Of Planes & Solids**: Projections of regular Planes, auxiliary planes and Auxiliary projection inclined to both planes. Projections of Regular Solids inclined to both planes - Auxiliary Views **Sections and Sectional Views**:-Right Regular Solids - Prism, Cylinder, Pyramid, Cone – Auxiliary views. **Development Solids**: Development of Surfaces of Right, RegularSolids -Prisms, Cylinder, Pyramid Cone and their parts. **Isometric Projections** : Principles of Isometric Projection - Isometric Scale - Isometric ViewsConventions - Isometric Views of Lines, Plane Figures, Simple and Compound Solids - Isometric Projection of objects having non- isometric lines. Isometric Projection of Spherical Parts, **Transformation of Projections** : Conversion of Isometric Views to Orthographic Views - Conventions

TEXT BOOKS:

1. Engineering Drawing, N.D. Bhat / Charotar

REFERENCE BOOKS:

1. Engineering Drawing and Graphics, Venugopal / New age
2. Engineering Drawing, Narayana and Kannaiah / Scitech publishers

WORKSHOP PRACTICE

Course code: 17 ME 1003 **L-T-P: 0-0-2**

Pre Requisite: NIL **Credits: 1**

Mapping of Course Outcomes (CO) to Student outcomes:

CO No:	CO	PO	BTL
1	prepare the different joints using carpentary trade by using wood as raw material	**5**	3
2	prepare the different fits using fitting trade with Ms plates as raw material	**5**	4
3	prepare the different components using Tinsmithy trade by using GI sheet as raw material	**5**	4
4	Apply basic electrical engineering knowledge for house wiring practice.	**5**	3

Syllabus:

Carpentry: Hands on practice on wood working operation using hand tools, **Fitting :** Hands on practice on preparing fits. **Tin smithy:** Hands on practice on sheet metal working. **House wiring**-Hands on practice on House wiring connections

Trades for Demonstration

1. Demonstration on drilling machine, power hacksaw machine,griding machine.
2. Demonstration on welding machine.

List of Experiments

1. Preparation Of Lap Tee Joint Using Carpentry Trade
2. Preparation Of Martise And Tenon Joint Using Carpentary trade
3. Preparation Of Square Fit Using Fitting Trade
4. Preparation Of L –Fit Using Fitting Trade
5. Preparation Of Rectangular Tray Using Tin smithy Trade
6. Preparation Of Pipe- T- Joint Using Tin smithy Trade
7. Preparation Of Stair Case Connection Using House Wiring Trade

8. Preparation Of Godown Connection Using House Wiring Trade
9. Disassemble And Assemble The Pc Back To Working Condition
10. Demonstration On Power hack Saw, Grinding Machine, Drilling Machine
11. Demonstration On Welding Machine.

Text Books:

1. P.Kannaiah and K. L. Narayana "Engineering Practices Laboratory",2009,SciTech Publications, Chennai

Reference Books:

1. K. Venkata Reddy, "Workshop Practice Manual", Sixth edition, 2011 print, BS Publications, Hyderabad.
2. B S Nagendra Parashar and R K Mittal, "Elements of Manufacturing Process", 2010 print, Prentice Hall of India, New Delhi

SIGNALS AND SYSTEMS

Course Code: 17 EM 2102 L-T-P: 2-2-2

Prerequisite: Nil Credits: 4

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	Mapped PO	B T L
1	Understand the representation, manipulation and operations of discrete Time Signals and Systems and illustration of sampling theorem.	**PO2**	**1**
2	Understand the Convolution and frequency domain representation of Z- Transforms and its application to LTI systems	**PO2**	**1**
3	Analyze Discrete Time signals in Fourier and fast Fourier transforms	**PO2**	**4**
4	Realization of Digital Filters: IIR and FIR	**PO2**	**4**
5	Apply and evaluate Signals and systems concept to various applications under time domain and transform domain	**PO5**	**5**

SYLLABUS

1. Signals: Classifications of continues time Signals and operations. **DT Sequences:** Representation of DT sequences, Some elementary DT sequences, Classification of discrete time sequences and Elementary manipulation of DT sequences. **DT Systems:** Input-out-put Description of Systems, Classification of DT systems: Linearity, Static, Time-Invariant, Causality and Stability of systems. Interconnection of DT system. Advantages of DSP systems over Analog processing systems. **Sampling and Reconstruction:** Graphical and analytical proof of sampling theorem. Reconstruction of signal from its samples.

2. Analysis of LTI Systems:: The Convolution Sum. Properties of Convolution, Causality and Stability of LTI systems in terms of impulse response. **Frequency domain representation of discrete time signals and systems:** Discrete Time Fourier Transform (DTFT) and its Properties. **Z-transforms**, System Function, Impulse Response, Causality and Stability of LTI systems in terms of System Function. **Applications of Z.Transforms**: Solutions of Linear Constant Coefficient Difference Equations.

3. **Fourier Transformation of Discrete Time Sequences:**

Discrete Fourier Transforms (DFT): Introduction to DFT, Properties of DFT, Circular convolution, Linear convolution using DFT, Computation of DFT **Fast Fourier Transforms**

(FFT): Introduction to FFT - Radix-2 Decimation in Time (DIT) and Decimation in Frequency (DIF) FFT Algorithms, Inverse FFT using direct FFT.

4. **Design and Realization of Digital IIR Filters: Digital Filter-IIR Design:** Introduction, properties of IIR filters. Design of Digital filters using Bilinear Transformation, Impulse invariance Methods, Frequency Transformation in Analog and Digital Domains. **Realization of IIR system structures:** Basic Elements of Digital Systems, Realization of Direct form structures, Cascade form Structures and Parallel form structures.

5. Design of Digital FIR Filters: Digital Filter-FIR Design: Designing FIR filters using Windowing Methods. Frequency Sampling Method, Comparison of IIR & FIR Filters. **Realization of FIR system structures:** Realization of Direct Form, Transposed Direct Form, Direct form for Linear-Phase FIR systems and Cascade Form structures.

TEXT BOOKS

1. John G. Proakis and Dimitris G. Manalakis, '**Digital Signal Processing**, principles, algorithms and applications', Pearson Prentice Hall, 2011.
2. Alan V. Oppenheim, Ronald W. Schafer, '**Discrete-Time Signal Processing'**, Pearson Education Signal Processing Series, 2002.
3. Dimitris G. Manalakis and Vinay Ingle, "**Applied Digital Signal Processing**, theory and practice'', Cambridge University Press, New York, 2011.
4. Monson H. Hayes, '**Digital Signal Processing**', Schaum's Outline series, Tata McGraw-Hill Publishing Company Limited, 2004.

REFERENCE TEXT BOOKS

1. Emmanuel C Ifechor, **Digital Signal Processing**, Pearson Education, 2nd Edition.
2. Andreas Antonious, " **Digital Signal Processing , Signals, Systems and Filters** " Mc-Graw Hill,
3. Kumar, A. Anand, "**Digital Signal Processing**", PHI.
4. Alan V. Oppenheium, Alan S. Willsky and Ian T. Young, '**Signals and Systems'**, Prentice hall of India Private Limited, 1994.

SIMULATION TEXT BOOKS

1. Vinay . Ingle, John G Proakis, "**Digital Signal Processing Using Matlab**" ,Pearson
2. Nasser kehtarnavaz, Namjin kim, "**Digital Signal Processing System Level Design using LabVIEW**", Elsevier.
3. E. S. Gopi, "Mathematical Summary for **Digital Signal Processing Applications with Matlab**", Springer

OBJECT ORIENTED PROGRAMMING

Course code: 17 CS 2004 **L-T-P:** 2-2-2

Pre Requisite: NIL **Credits: 4**

Mapping of Course outcomes with Program outcomes

CO.NO.	Course outcome's	Mapped PO/PSO	BTL
CO1	Understand Basic Concepts of OOP, introduction to classes and objects through Java Language and apply.	2	3
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	5	5
CO5	Apply OOP concepts for developing an application	5/1	5

Syllabus:

Introduction: Object-Oriented Programming, OOP Principles, Encapsulation, Inheritance and Polymorphism Java as a OOPs & Internet Enabled language, The Byte code, Data types, Variables, Dynamic initialization, scope and life time of variables, Arrays, Operators, Control statements, Type Conversion and Casting, Compiling and running of simple Java program. Classes and Objects: Concepts of classes and objects, Declaring objects, Assigning Object Reference Variables, Methods, Constructors, Access Control, Garbage Collection, Usage of static with data and methods, usage of final with data, Overloading methods and constructors, parameter passing - call by value, recursion, Nested classes. Inheritance: Inheritance Basics, member access rules, Usage of super key word, forms of inheritance, Method Overriding, Abstract classes, Dynamic method dispatch, Using final with inheritance, The Object class. Packages and Interfaces: Packages, Classpath, Importing packages, differences between classes and interfaces, Implementing & Applying interface. I/O Streams- file, byte streams, character streams, Exception Handling: Exception Handling fundamentals, Types of Exceptions, Usage of try and catch, throw, throws and finally keywords, Multithreading.

Text Books:

1. Herbert Schildt, "The Complete Reference Java2", 7th edition TMH,(2002).
2. Timothy A. Budd, "An Introduction to Object-Oriented Programming", 3/E, Pearson, (2008).

Reference Books:

1. Jim Keogh, "The Complete Reference J2EE", TMH, (2006).
2. Deitel & Deitel, "'JAVA – How to program", 6th edition, PHI,(2007).

Cay.S.Horstmann and Gary Cornell "Core Java 2, Vol 1, Fundamentals", Seventh Edition, Pearson Education.

DISCRETE MATHEMATICS

Course code: 17 CS 2005 **L-T-P:** 3-1-0

Pre Requisite: NIL **Credits: 4**

Mapping of Course outcomes with Program outcomes

CO.NO.	Course outcome's	Mapped PO/PSO	BTL
CO1	Understand sets, relations, functions and discrete structures , Count discrete event occurrences	**1**	**3**
CO2	Apply Propositional logic and First order logic to solve problems	**1**	**4**
CO3	Formulate and solve recurrence relations, apply algebraic structures and lattices.	**5**	**4**
CO4	To identify the basic properties of graphs and trees and model simple applications	**5**	**4**

Syllabus:

The Foundations: Logic and Proofs: Propositional Logic, Applications of Propositional, Propositional Equivalences, Predicates and Quantifiers, Nested Quantifiers, Rules of Inference, Introduction to Proofs, Proof Methods and Strategy . **Basic Structures: Sets, Functions, Sequences, Sums, and Matrices:** Sets , Set Operations , Functions, Sequences and Summations, Cardinality of Sets, Matrices. **Induction and Recursion** Mathematical Induction, Strong Induction and Well-Ordering, Recursive Definitions and Structural Induction, Recursive Algorithms, Program Correctness. **Counting:** The Basics of Counting, The Pigeonhole Principle, Permutations and Combinations, Binomial Coefficients and Identities, Generalized, Permutations and Combinations, Generating Permutations and Combinations. **Advanced Counting Techniques:** Applications of Recurrence Relations, Solving Linear Recurrence Relations, Divide-and-Conquer Algorithms and Recurrence Relations, Generating Functions, Inclusion–Exclusion , Applications of Inclusion–Exclusion. **Relations:** Relations and Their Properties, *n*-ary Relations and Their Applications, Representing Relations, Closures of Relations, Equivalence Relations, Partial Orderings,Lattices. **Graphs:** Graphs and Graph Models, Graph Terminology and Special Types of Graphs, Representing Graphs and Graph Isomorphism, Connectivity, Euler and Hamilton Paths, Shortest-Path Problems, Planar Graphs, Graph Coloring. **Trees:** Introduction to Trees, Applications of Trees, Tree Traversal, Spanning Trees, Minimum Spanning Trees. **Algebraic Structures:** Algebraic Systems-Semi Groups, Monoids-Groups-Subgroups and Homomorphisms- Cosets and Lagrange's Theorem- Ring and Fields (Definitions and Examples).

Text Books:

1. Kenneth H. Rosen, "Discrete Mathematics and its Applications", Special Indian Edition, 7th Edition, Tata Mcgraw-Hill Publisher, New Delhi.
2. Ralph P. Grimaldi, "Discrete and Combinatorial Mathematics: An Applied Introduction", 4th Edition, Pearson Education Asia, Delhi, (2002).

Reference Books:

1. Joe L. Mott, Abraham Kandel, Theodare P. Baker ,"Discrete mathematics for computer scientists and mathematicians" Second Edition, PHI.
2. Tremplay J P and Manohar R, "Discrete Mathematical Structures with Applications to Computer Science", Tata McGraw Hill Publishing Company Limited, New Delhi, (2007).

Thomas Koshy., "Discrete Mathematics with Applications", Elsevier Publications, (2006).

PROFESSIONAL CORE

COMPUTER ORGANIZATION

Course code :17EM2103 L – T – P: 2 – 2 - 2

Pre Requisite : NIL Credits: 4

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	Mapped PO	BTL
1	Understand the logical gates to construct combinational & sequential circuits to perform Arithmetic µ-Operations.	PO3,PO5	1
2	Write Micro Programs for design of Control Unit	PO3,PO5	2
3	Analyze operations like Multiplication, Floating Point algorithms	PO3,PO5	4

4	Understand the Peripherals, I/O interface and Direct Memory Access	PO3,PO5	1
5	Examine the functional verification of the digital circuits on Logisim	PO3,PO5,PSO1	5

SYLLABUS:

Digital Logic Circuits: Digital Compute Logic Gate, Boolean Algebra, Maps Simplification, Combinational Circuits, Flip Flops, Sequential Circuits Digital Components: Integrated Circuits, Decoders, Multiplexers, Registers, Shift Registers, Binary Counter, Memory Unit Data Representation: Divide Layer, Complement, Fixed Point Representation, Floating Point Representation, Binary Codes, Error Codes.

Register Transfers and Micro Operations: Register Transfer Language, Register Transfer, Bus and Memory Transfer, Arithmetic Microprocessors, Logic Microprocessors, Shift Microprocessors, Arithmetic Logic Shift Unit.

Basic Computer Organization and Design: Internal Codes, Computer Register, Computer Instructions, Timing & Control, Instruction Cycle, Memory Reference Instructions, Input-Ouput and Interrupt

MicroProgrammed Control: Control Memory, Address Sequencing, Microprogramme Example, Design of Control Unit

Central Processing Unit: General Register Organization, Stack Organization, Instruction Formats, Addressing Modes, Data Transfer and Manipulation, Program Control, RISC.

Computer Arithmetic: Addition and Subtractions, Multiplication Algorithms, Division Algorithms, Floating Point Arithmetic Operations, Decimal Arithmetic Unit, Decimal Arithmetic Operations.

Input-Output Organization: Peripheral Devices, Input Output Interface, Asynchronous Data Transfer, Modes of Transfers, Priority Interrupt, Discrete Memory Access, Input-Output Memory Organization: Memory Hierarchy, Main Memory, Auxillary Memory, Associate Memory, Cache Memory, Virtual Memory, Memory Management Hardware.

TEXT BOOK:

1. M. Morris Mano; Computer System Architecture, Third Edition, PHI

REFERENCE BOOK:

1. John P. Hyes; Computer Architecture and Organisation, 2nd Edition.

ELECTRONIC DEVICES AND CIRCUITS

Course code : 17EM2207 L – T – P: 2 – 2 - 2

Pre Requisite : NIL Credits: 4

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	Mapped PO	B T L
1	Analyze the concepts of various diodes and their applications.	**PO3**	**4**
2	Analyze BJT concepts as operation, biasing and frequency response	**PO3**	**4**
3	Analyze FET concepts as operation, biasing and frequency response	**PO3**	**4**
4	Analyze the usage of Power Amplifiers	**PO3**	**4**
5	Develop applications involving the usage of Diodes,BJT,FET and power amplifiers	**PO5**	**6**

P-N Junctions: Diode theory, forward and reverse-biased junctions, reverse-bias breakdown, load line analysis, diode applications, half wave & full wave rectification, Capacitor filters, ripple factor,Voltage Multipliers & Peak Detector. Special purpose diodes - Zener diode, Varactor, Light Emitting Diodes & LASER Diode.

Transistor biasing & stability: Configuration of Transistor CE,CB & CC, Q point, Self-Bias-CE, Expression of voltage gain, current gain, input & output impedance, Emitter follower circuits. Stability Factor of Transistor. FET: Configurations of FET, CS, CG & CD. Biasing of JFET.MOSFET :Depletion and Enhancement MOSFET& Biasing of MOSFET.

Transistor amplifiers: Equivalent circuit of BJT & FET , Low frequency models of BJT and FET.BJT and FET amplifiers, High frequency models for BJT and FET, Frequency response of CS and CE amplifiers, Cascode amplifiers, Emitter follower..

Power amplifiers: Class A Common Emitter Power Amplifier,Transformer Coupled Amplifier,Class B Push-Pull Power Amplifiers,Class AB, Class C, ,Class D Amplifier,Conversion efficiency, Distortion.

Text books:

1. Muhammad H. Rashid, "Microelectronic Circuits Analysis and Design", 2nd edition, Cengage Learning.
2. Sedra & Smith, "Micro-Electronic Circuits theory and applications", Oxford Press

Reference Books:

1.Jacob Millman & Christos C.Halkias, "Integrated Electronics", Tata-McGraw Hill, 2ndEdition, (2010).

2.Robert L. Boylestad and Louis Nashelsky, "Electronic Devices and Circuit Theory", PHI. 9th Edition.

LINEAR INTEGRATD CIRCUIT ANALYSIS

Course code :17EM3108 L – T – P**:** 2 –2 - 2

Pre Requisite:17EM2207 **Credits: 4**

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	Mapped PO	B T L
1	Analyze the concepts of operational amplifiers and their applications.	**PO3**	**4**
2	Analyze the concepts of various active filters and their applications	**PO3**	**4**
3	Analyze the concepts of various Feedback amplifiers and their applications	**PO3**	**4**
4	Analyze the concepts of various data converters and their applications	**PO3**	**4**
5	Develop applications involving the usage of opamps,filters,feedback amplifiers and data converters	**PO5**	**6**

SYLLABUS

Operational Amplifiers, Ideal characteristics. Applications of Op-amp: Inverting ,Non-inverting, Voltage follower, Differentiator , Integrator I-V , V-I Converters Current Amplifier , Differential Amplifier, Instrumentation Amplifier ,Log and antilog amplifiers. Voltage Comparator, Schimtt Trigger, Sample and hold amplifier.

Active filters: First order and Second Order Low Pass Filter, High Pass Filter, Band Pass Filter, Band Stop Filter and All Pass Filters. Multivibrators using opamps. 555 timer.

Triggering circuits for bistable and monostable multivibrators.
Feed Back Amplifier : Positive and Negative Feedback amplifier. Oscillators: Condition for Sustained oscillation ,RC phase Shift Oscillators , Wein bridge ,Colpitts , Hartley and Crystal Oscillators.
Data converters: A/D and D/A converters. PLL: Applications of PLL.Voltage References and regulators: Performance specifications ,Regulators using Opamps. IC Regulators: positive , negative and variable voltage regulator.

Text Books:

1. R.Gayakwad, Op-amps and Linear Integrated Circuits (4/e), PHID.
2. S.Franco, Design with Operational Amplifiers and Analog Integrated Circuits (3/e) TMH, 2003.

PROCESSORS AND CONTROLLERS

Course code :17EM2204 L – T – P: 2 – 2 - 2
Pre Requisite : 17EM2103 Credits: 4

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	Mapped PO	B T L
1	Able to understand and analyze the architectural features of CISC type of General purpose processor Intel 8086 Microprocessor.	PO2,PO5	2
2	Able to understand and analyze the architectural features of CISC type of microcontroller - Intel 8051 Microcontroller.	PO2,PO5	4
3	Able to program 8086 microprocessor, 8051 microcontrollers in assembly language using TASM, KEIL, MPLAB and Proteus tools	PO2,PO5	3
4	Able to Understand and analyze the architectural features of Atmega processor.	PO2,PO5	4
5	Able to Develop a real time application using 8051 &Atmega processors through project based labs.	PO2,PO5,PSO1	6

SYLLABUS:

8086 Microprocessor: Introduction to Microprocessor, Intel Microprocessor families ,8086 Microprocessor architecture, Register Organization, Pin Description, Physical Memory Organization, Modes of operation. 8086 Instruction set & Assembly Language programming: Addressing modes, Instruction set, Assembler directives, simple Programs, Procedures and Macros, 8086 Interrupts. **8051 Microcontroller:** Microcontroller families, 8051 Architecture, Signal Description, Register organization, Internal RAM, Special Function Registers, Interrupt control flow, Timer/Counter Operation, Serial Data Communication, and RS-232C Standard.8051 Programming & Interfacing: Addressing modes, Instruction set, Simple Programs involving Arithmetic and Logical Instructions, Timers/Counters, Serial Communication & Interrupts. Interfacing: Matrix Key Board, Stepper Motor, LCD's, DAC & ADC using 8051. **Introduction to Atmega Processors**: Introduction, Atmega Processor, ports, Timers and Counters, Status register, General purpose registers, Stack, Interrupt Vectors of ATmega processor, serial ports, Memory map, ATmega Analog to digital converter.

TEXT BOOKS

1. D.V.Hall "Microprocessor and Interfacing", 2nd Edition Tata McGraw Hill Publishing Company,2006.
2.Mazidi & Mc Kinley "The 8051 Micro controller and Embedded systems: using assembles and C, 2nd edition,2007.
3. B.Kanta Rao, "Embedded Systems" PHI, 2011

REFERENCE BOOKS

A.K. Ray & K. M Bhurchandi, "Advanced Microprocessors & peripherals", Tata McHill

EMBEDDED SYSTEMS DESIGN

Course code : 17EM3106 L – T – P: 2 – 2 - 2
Pre Requisite : 17EM2204 Credits: 4

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	Mapped PO	B T L
1	Able to analyze embedded systems and program on chip peripherals for a single purpose controller	**PO3,PO5**	**4**
2	Able to interface and program different off chip peripherals and communication protocols used in embedded systems	**PO3,PO5**	**3**
3	Able to understand, evaluate and select appropriate software architectures	**PO3,PO5**	**5**
4	Able to analyze and design embedded systems using the features in real time operating systems.	**PO3,PO5**	**4**
5	Able to develop a prototype for a real time embedded application using project based labs.	**PO3,PO5,PSO1**	**6**

Syllabus

ES Basics: Introduction to Embedded Systems: Definition, Comparison with Loaded Systems, Challenges of Embedded systems, Application of Embedded Systems. Software development process and tools, Testing and Debugging Techniques, Testing and Debugging Tools. Hardware fundamentals: Power and decoupling, Open collector out puts, Tristate outputs, Signal loading related issues, Memories type and selection, Processor types and selection, Timers, Counters, Pulse width Modulators for speed control, LCD Controllers, Key Pad Controllers, Stepper motor controllers, A/D Converters, Sensors and Actuators: Temp Sensors, Flow Control devices, Humidity Control devices, Speed Control devices. Interfacing Sensors and Actuators with microcontrollers. (With reference to Arduino platform.) Interfacing: I/O Addressing: Port Based Addressing, Bus Based addressing, Interfacing Micro Processors through Interrupts, Shared data problems Interrupt Latency and DMA. Overview of Serial Communication using RS232C, I2C, CAN, USB, Wireless Communication using IrDA, Blue Tooth, 802.11g, and Parallel Communication using PCI Bus, AMBA Bus. Software Architectures and RTOS: Overview of Round Robin, Round Robin with Interrupts, Function Queue Scheduling, RTOS architectures and selecting the architecture. Real Time Operating Systems: Tasks and Task data, Scheduler, Reentrancy, Semaphores, Message Queues, Mail Boxes, Pipes, Timer Functions, Event Handling, Memory Management, Interrupt Processing, and Power Saving Functions. Designing Embedded Systems using RTOS: General Design Principles, Hardware and software CO design and Real Time Scheduling Considerations,

Text books:

1. An Embedded Software Premier - David E- Simon, PEARSON Education
2. Embedded System Design - Frank Vahid / Tony Givargis, WILEY India
3. C Programming for Arduino", Julien Bayle Packt Publishing, 2013 Edition.

Reference Books:

1. Embedded / real - time systems - DR.K.V.K.K.Prasad, dreamtech
2. Embedded Systems - Raj – Kamal, Second Edition TMH
3. The FreeRTOS™ Reference Manual", © Real Time Engineers Ltd. 2016

FPGA BASED SYSTEM DESIGN

Course code :17EM3205 L – T – P: 2 – 2 - 2

Pre Requisite : 17EM2103 Credits: 4

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	Mapped PO	B T L
1	Understand the basic concepts of Verilog programming	PO2	1
2	Understand the Combinational & sequential logic circuits and analyze them through test benches using Verilog HDL	PO2	4
3	Understand FPGA based embedded processors architectures	PO2	1
4	Understand signal conditioning and serial communication protocols	PO2	1
5	Analyze the digital modules through project oriented approach	PO5	4

Verilog Language Concepts: Verilog HDL, Elements of Verilog, Component Description in Verilog, Test-benches, Characterizing Hardware Languages, Module Basics, Verilog Simulation Model, Compiler Directives, System Tasks and Functions, RT Level Design. **Combinational circuit Description:** Module Wires, Gate Level Logic, Hierarchical Structures, Describing Expressions with Assign Statements, Behavioral Combinational Descriptions, Combinational Synthesis. **Sequential Circuit Description:** Sequential Models, Basic Memory Components, Functional Registers, State Machine Coding, Sequential Synthesis. **FPGA based Embedded Processors:** FPGA and CPLD, Architecture of a FPGA, Floor Plan and Routing, Timing Model for a FPGA, FPGA Power Usage, Hardware–Software Task Partitioning, FPGA Fabric Immersed Processors, Interfacing Memory to the Processor, Interfacing Processor with Peripherals, Design Re-use Using On-chip Bus Interface, Creating a Customized Microcontroller, Robot Axis Position Control **FPGA-based Signal Interfacing and Conditioning:** Serial Data Communication, Physical Layer for Serial Communication, Serial Peripheral Interface (SPI), Signal Conditioning with FPGAs, Introduction to Motor Drives, Digital Block Diagram for Robot Axis Control

Text Books:

1. Zainalabedin Navabi, Verilog Digital System Design RT Level Synthesis, Testbench and Verification Second Edition McGraw-Hill Publications
2. Rahul Dubey , Introduction to Embedded System Design Using Field Programmable Gate Arrays, Springer Publications, ISBN 978-1-84882-015-9

Reference Books:

1. Peter J. Ashenden, Digital Design An Embedded Systems Approach Using Verilog, MK Publishers
2. Steve Kilts, Advanced FPGA Design Architecture, Implementation, and Optimization, WILEY Publications
3. Ted Huffmire, Handbook of FPGA Design Security, Springer Publications

FUNDAMENTALS OF COMMUNICATION SYSTEMS

Course code : 17EM4109 L – T – P: 2 – 2 - 2

Pre Requisite : 17EM2102 Credits: 4

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	Mapped PO	B T L
1	Understand the basics of Amplitude modulation	PO1,PO2	2
2	Demonstrate the AM and FM transmitter and Receiver circuit	PO1,PO2	2
3	Demonstration of PCM	PO1,PO2	2
4	Discuss about different types of Keying Techniques in Digital modulation	PO1,PO2	2
5	Verification of Analog nd Digital modulations	PO1,PO2	4

Modulation techniques:

Block diagram of Analog and Digital Communication System, Linear Modulation, ,Continuous wave AM Generation and Demodulation of AM: DSB, DSB-SC, SSB and VSB. Frequency Translation and Frequency-Division Multiplexing . Angel Modulation: frequency and Phase modulation, narrow band and wide band F.M, Direct and indirect methods of generation of F.M, demodulation of F.M wave.

Transmitters and Recievers: A.M Transmitter and F.M.Transmiter. Armstrong method receiver, AM Superhetrodyne receivers , FM Super hetrodyne receivers.

Pulse modulation techniques Pulse Amplitude Modulation ,Bandwidth –Noise Trade-off, Quantization process ,PCM,Noise Consideration in PCM Systems, TDM, Delta Modulation, Differential Pulse Code Modulation, Adaptive pulse code modulation. Modulation and Demodulation of PPM & PWM.

Data Transmission: Introduction , Amplitude Shift Keying, Frequency Shift Keying, Phase Shift Keying, Differential Phase Shift Keying, Baseband Signal Receiver and Probability of Error.

Text Books:

1.“ Communication System” – By Simon Haykin, 4th Edition,2009.

2. “Communication Systems” by Singh R.P. and Sapre S.D – TMH.

Reference Books:

1. “Analog and Digital Communications” – By Sam K.Shanmugam, Wiley,2009.
2. “Modern Digital & Analog Communication Systems” – By B.P. Lathi, 3rd Edition,2009

SOFTWARE ENGINEERING

Course code: 17 CS 2008 **L-T-P:** 3-1-0
Pre Requisite: 17 CS 2004 **Credits: 4**

COURSE OUTCOMES (CO's):

Sno	Course Outcome	Mapped PO/PSO	BTL's
CO1	Identify software evolution and software development life cycle with associated process models by emphasizing agile methodology including modeling core principles	1	3
CO2	Demonstrate the concepts of requirement modeling carrying out the analysis and basic design model with a case study	4,2,8	3
CO3	Classify Software Architecture, Software design and Demonstrate User Interface for an application using golden rules of HCI	4,2	4
CO4	Evaluate testing strategies and software quality assurance for a given case study.	2	5

SYLLABUS:

Software and software engineering: Nature of software, software application domains, unique nature of web applications, software engineering, software process, software engineering practices, software myths. Process models: Generic process models, perspective models, product and process. Agile development: Agility, agile process, extreme programming and other agile process models. Modeling: Core Principles, principles that guide each framework activity, Understanding requirements: identifying stakeholders, eliciting requirements, building requirement model, negotiating and validation requirements, Requirement Modeling Design Concepts: Design process, Concepts and models. Architecture design: software architectures, architecture styles and designs, architectural mapping using dataflow. User Interface design: The golden rules, User interface analysis and design. Software testing: A strategic approach to software testing, strategic issues, test strategies for conventional software, Black-Box and White-Box testing, validation testing, system testing. SPI, CMMI. Software quality assurance: Elements of software quality assurance, sqa tasks, goals.

Text Books:

1.Roger S.Pressman ,"Software Engineering – A Practitioner's Approach 7th Edition,Mc Graw Hill,(2010).

Reference Books:

1.Ian Sommerville, 'Software Engineering', Sixth Edition, Pearson Education,(2001).
2. Craig Larman, "Applying UML and Patterns: An introduction to OOAD and design and interface deployment", Pearson, (2002).
3. Stephen R.Schach, "Software Engineering", Tata McGraw-Hill Publishing Company Limited, (2007).

DATABASE MANAGEMENT SYSTEM

Course code: 17 CS 2210 **L-T-P:** 2-2-2
Pre Requisite: 17 CS 1102 **Credits: 4**

Mapping of Course outcomes with Program outcomes

CO.NO.	Course outcome's	Mapped PO/PSO	BTL

CO1	Illustrate the functional components of the DBMS, importance of modeling in design of a database	**4**	**1**
CO2	Build queries using SQL and concepts of relational algebra	**3,4**	**3**
CO3	Apply normalization techniques and indexing to construct and access decent database	**4**	**4**
CO4	Understand importance of transaction processing and concurrency control	**4**	**2**
CO5	Create a good database and develop SQL queries for data analysis	**4,5/1**	**6**

SYLLABUS:

Database Fundamentals: DBMS Characteristics & Advantages, Database Environment, Database Users, Database Architecture, Data Independence, Languages, Tools and Interface in DBMS, DBMS types

Data Modelling: ER Model, Notation used in ER Diagram, Constraint, Types, Relationships in ER Model and other considerations in designing ER diagram. Enhanced ER data Model, EER Diagram, Specialization and Generalization, Lattice, Union, Disjoint Properties, Constraints and relationships, Other issues in designing EER diagrams, Relational Model, Relational Algebra, Operators in relational algebra, Algorithms for ER to relational mapping.

SQL: Data Definition and other languages in SQL, Creating tables and Data types, Constraints, DML statements, Functions and writing SQL statements using nested sub queries, complex queries, joining relations, Security: access control via database views.

Database Design: Guidelines for good database design, Normalization- Normal Forms, First, Second, Third Normal Forms, BCNF, Multi value and join dependencies, 4^{th} and 5^{th} normal forms. Decomposition algorithms for normalization. File and storage structures: File storage, Index structures, Indexing and hashing. Query Processing: Issues in query processing, simple algorithms for insert, project, join and other operators.

Transaction Processing: Transaction processing issues, Transaction states, problems during multiple transactions processing, ACID properties, system log and concurrency control techniques: binary locks**,** exclusive locks, Lock based techniques, and Timestamp based techniques, versioning in locks, Multi-version locking techniques.

Text Books:

1.Elmasri and Navathe, 'Fundamentals of Database Systems', 6^{th} edition, Pearson Education, (2008).

2.A. Silberschatz, Henry F Korth, S. Sudarshan, "Database System Concepts:,Fifth Edition, Tata McGraw-Hill,(2003).

Reference Books:

1.Raghu Ramakrishnan, Johannes Gehrke, "Database Management Systems", second Edition, Tata McGraw Hill, (2004).

DESIGN AND ANALYSIS OF ALGORITHMS

Course code: 17 CS 2211 **L-T-P:** 2-2-2

Pre Requisite: 17 CS 1102 **Credits: 4**

Mapping of Course outcomes with Program outcomes

CO No	Course Outcome (CO)	Mapped PO/PSO	Blooms Taxonomy Level (BTL)
1	Understand time and space complexity, analyze complexity for problems solvable by divide and conquer technique	**2**	**2**
2	Apply greedy and dynamic algorithm design methodologies to solve problems.	**5**	**4**
3	Apply state space tree methods for solving searching problems.	**2**	**4**
4	Distinguish between P and NP classes of problems and solve complex problems	**2**	**4**
5	Apply algorithm design techniques to solve any real world problems	**5/1**	**5**

SYLLABUS:

Introduction: Definition of an Algorithm- Algorithm Specification - Analysis of Algorithm. **Divide and Conquer:** Merge Sort-Quick Sort- Strassen's Matrix Multiplication – Convex Hull. **Greedy Method:** The General Method-Job Sequencing with Deadlines- Knapsack Problem- Minimum Cost Spanning Trees- Huffman Codes -Single Source Shortest Path Method. **Dynamic Programming:** The General Method- Optimal Binary Search Tree- 0/1 Knapsack-Traveling Sales Person Problem. Ford Fulkerson. **Backtracking:** The Eight Queens Problem - Sum Of Subset Problem - Graph Coloring - Knapsack Problem. **Branch and Bound:** 0/I Knapsack Problem- Traveling Sales Person Problem- **NP Hard and NP Complete Problems:** Basic Concepts- Cook's Theorem-NP Hard Graph Problems- CDP, NCDP, AOG.. **PRAM Algorithms:** Merging-Sorting. String Algorithms.

TEXT BOOKS:

1. Ellis Horowitz, Sartaj Sahni and Sanguthevar Rajasekaran, "Fundamentals of Computer Algorithms", 2nd Edition, University Press, 2008.
2. Cormen, Leizerson & Rivest, "Introduction to algorithms", 3rd Edition, Prentice-Hall, 2002.
3. Jon Kleinberg and Eva Tardos, "Algorithm Design", Pearson Education, 2006.

REFERENCE BOOKS:

1. Robert Sedgewick and Kevin wayne ,"Algorithms", 4th edition,Addison Wesley Prof., (2011).
2. Anny Levitin, "Introduction to Design and Analysis of Algorithms", 2rd Edition, Person Education Press. (2007).
3. Michael T.Goodrich and Roberto Tamassia, Algorithm Design: Foundations, Analysis and Internet Examples, Second Edition, Wiley-India, (200)6.

Steven S. Skiena, "The Algorithm Design Manual", Second Edition, Springer, (2008)

OPERATING SYSTEMS

Course code: 17 CS 3113 **L-T-P:** 2-2-2

Pre Requisite: 17 CS 2209/ 17 EM 2102 **Credits: 4**

Mapping of Course Outcomes with Program Outcomes

CO	Course Outcomes	Mapped PO	BTL
CO1	Explain Operating System Concepts and Evaluation of Operating Systems	1,2	1
CO2	Illustrate a process, synchronization of process and IPC. **Implement** algorithms for Deadlocks using Banker's Algorithm	4	3
CO3	Demonstrate paging techniques and **Implement** Virtual Memory using Page Replacement Algorithms	4	3
CO4	Implement the File management process in OS	2	4
CO5	Develop Application Programs using UNIX System Calls (Lab Component)	5/1	6

Syllabus:

Introduction to OS , types of OS, OS structure, OS services, user OS interfaces, system calls and their types, virtual machine, schedulers, context switching, scheduling algorithms, Inter process Communication (IPC), Shared Memory, Pipes, Queues, Sockets.

Process, Synchronization of Processes, Condition Variables, Semaphores, Common Concurrency Problems, Locks, Threads, Dead Locks & Banker's Algorithm

Memory Management, Paging, Segmentation, Virtualization, Virtual Memory, Page Replacement Algorithms.

File management, I/O Devices, Hard Disk Drives, Redundant Disk Arrays Files and Directories, File system implementation.

Text Books:

1. Operating System Concepts by Abraham Silberschatz, Peter Baer Galvin and Greg Gagne, 9th Edition, John Wiley & Sons Inc.(Year Meet)
2. UNIX Internals – The New Frontiers by UreshVahalia, Pearson Edition (2006)

Reference Books:

1. Modern Operating Systems by Andrew S Tanenbaum, Prentice Hall
2. Operating Systems by William Stallings 4th Edition (2013)
3. Operating Systems: Three Easy Pieces, Remzi H. Arpaci-Dusseau and Andrea C. Arpaci-Dusseau, Arpaci-Dusseau Books, May- 2014.

COMPUTER NETWORKS

Course code: 17 CS 3114 **L-T-P: 3-0-2**

Pre Requisite: NIL **Credits: 4**

CO No	Course Outcome	Mapped PO/PSO	BTL
CO 1	Understand the basics of networking and function of physical Layer	1	2
CO 2	Understand the functions of Data Link Layer and apply the principles into program practice.	1,2	2
CO 3	Understand the functions of Network layer and use routing algorithms into program practice.	1,2	2
CO 4	Apply the Transport and application layer principles into programming.	2	3
CO 5	Experiment with Networking programs	2	5

Syllabus:

Use of Computer Networks, Network Hardware, Network software, Reference models, Example Networks Physical Layer: The theoretical basis for Data Communication, Guided Transmission media, Modems, ADSL, Trunks and Multiplexing, switching Data Link Layer: DLL design issues. Error Detection and Correction, Elementary data link protocols, sliding window protocols. Medium Access Control Sub layer: Channel allocation problem, multiple access protocols, Ethernet, Data link Layer switching Network Layer: Network layer design issues, Routing algorithms, congestion control algorithms, Quality of service, Internetworking, network layer in the Internet Transport Layer: Transport service, Elements of transport protocols, Internet transport protocols:TCP&UDP,Performance Issues Application Layer: Domain Name System, Electronic Mail, World Wide Web.

Text Books:

1. Andrew S. Tanenbaum, David J. Wetherall, Computer Networks, Prentice Hall, Fifth Edition. 2011
2. Behrouz A. Fourouzan, TCP/IP Protocol Suite, Tata McGraw Hill, Third Edition, 2006.

Reference Books:

1.James F. Kurose, Keith W. Ross, "Computer Networking:A Top-Down Approach", Pearson Education, 2012.

2. William Stallings, Data and Computer Communications, 7/e, Pearson Edition, ,2007

3.John Goerzon, Tim bower, Brandon Rhodes, foundation of python network programming,2010, edition 2, publisher:Apress

INTERNET PROGRAMMING

Course code : 17EM3110 L – T – P: 2 – 2 - 2

Pre Requisite : 17CS2004 Credits: 4

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	Mapped PO	B T L
1	Able to create Static Web pages using basic HTML & apply CSS	PO2,PO5	6
2	Able to apply javascript features for form validations and event handling	PO2,PO5	3
3	Able to create databases using MYSQL and apply JDBC concepts to connect to a database.	PO2,PO5	6
4	Able to create dynamic web pages using servlets & JSP	PO2,PO5	6
5	Must be able to design WEB site considering the user interface, navigation and interaction with database using project based LABS	PO2,PO5,PSO2	6

SYLLABUS:

Introduction to HTML5: Headings, Linking, Images, Lists, Tables, Frames, Forms and Input types.**Cascading Style Sheets (CSS3):** Inline Styles, Embedded Style Sheets, Linking External Style Sheets, Positioning Elements.**JavaScript**: Control Statements-(if, if-else, switch, while, do-while, for), Document Object Model –objects and collections, Event Handling, Introduction to JQuery, XML**Database Access with JDBC**: JDBC architecture, Connection Object, Working

with statements, Creating and executing SQL statements, working with Result Set.**Servlets & Java Server Pages:** Servlet Basics: Handling the Client Request, Generating the Server Response, Overview of JSP Technology, JSP Scripting Elements, Implicit Objects, Accessing MYSQL Database with JDBC.

Text Books :

1.Deitel & Deitel & Nieto, "Internet & World Wide Web – How to Program", PEA, Fifth Edition.2010.
2.Falkner & Jones," Servlets and Java Server Pages: The J2EE Technology Web Tier", 1/e, Addison-Wesley Professional,2008.

Reference Books:

1.Chris Bates, "Web Programming Building Internet Applications", 3rd Edition, Wiley India, 2006.
2.Anders Moller, Michael Schwartzbach, "An Introduction to XML and Web Technologies", 1st Edition, Pearson Education, 2006.
3.Ivan BayRoss, "Web Enabled Commercial Application Development using HTML, DHTML, JavaScript, Perl", BPB Publication, 3rd Edition, 2005.
4.Uttam K Roy, "Web Technologies", OXFORD University Press, 2012.
5."Advanced Java 2 Platform -HOW TO PROGRAM" by H. M.Deitel, P. J. Deitel, S. E. Santry – Prentice Hall.
6."Beginning Java™ EE 6 Platform with GlassFish 3 From Novice to Professional" by Antonio Goncalves - Apress publication.

AUTOMATA AND COMPILER DESIGN

Course code : 17EM3211 L – T – P: 2 – 2 - 2
Pre Requisite : 17CS2005 Credits: 4

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	Mapped PO	B T L
1	Able to analyze formal languages, Grammars and finite automata	PO1,PO5	4
2	Able to analyze the grammar based on top down and bottom up parser.	PO1,PO5	4
3	Able to understand SDT and generate intermediate code	PO1,PO5	1
4	Able to apply code optimization techniques	PO1,PO5	3
5	Able to Analyze various phases of compiler through project based labs	PO1,PO5	4

SYLLABUS:

Formal Language and Regular Expressions : Languages, Definition Languages regular expressions, **Finite Automata** - DFA, NFA. Conversion of regular expression to NFA, NFA to DFA. Applications of Finite Automata to lexical analysis, lex tools.**Context Free grammars and parsing** : Context free grammars, derivation, parse trees, ambiguity LL(K) grammars and LL(1) parsing. Bottom up parsing handle pruning LR Grammar Parsing, LALR parsing, parsing ambiguous grammars.**Syntax directed translation**, S-attributed and L-attributed grammars, Intermediate code - abstract syntax tree, translation of simple statements and control flow statements. **Context Sensitive features** - Chomsky hierarchy of languages and recognizers. Type checking, type conversions, equivalence of type expressions, overloading of functions and

operations. **Run time storage** : Storage organization, storage allocation strategies scope access to now local names, parameters, language facilities for dynamics storage allocation. **Code optimization** : Principal sources of optimization, optimization of basic blocks, peephole optimization, flow graphs, Data flow analysis of flow graphs. **Code generation** : Machine dependent code generation, object code forms, generic code generation algorithm, Register allocation and assignment. Using DAG representation of Block.

TEXT BOOKS :

1. Introduction to Theory of computation. Sipser,2nd Edition,Thomson.,2009.
2. Compilers Principles, Techniques and Tools Aho, Ullman, Ravisethi, Pearson Education,2009.

REFERENCES :

1. Introduction Automata theory and formal languages, and computation, John E Hopcraft and JD Ullman,2007.
2. Modern Compiler Construction in C , Andrew W.Appel Cambridge University Press.,2005.
3. Compiler Construction, LOUDEN, Thomson,2006.

NETWORK SECURITY

Course code :17EM3112 L – T – P: 2 – 2 - 2
Pre Requisite : 17CS3114 Credits: 4

Mapping of Course Outcomes (CO) to Student outcomes:

CO NO	Course Outcome	Mapped SO	B T L
1	Apply Symmetric key cryptography techniques to encrypt and decrypt data	**PO1**	**3**
2	Apply public key cryptography techniques to encrypt and decrypt data	**PO1**	**3**
3	Apply Hash Function and Digital Signature to authenticate the data	**PO1**	**3**
4	Understand basic network and system level security concepts	**PO1**	**1**
5	Develop applications involving protection of data using symmetric key,public key ,MAC and Digital signature techniques.	**PO2,PO5,PSO2**	**6**

SYLLABUS:

INTRODUCTION OSI Security Architecture - Classical Encryption techniques – Cipher Principles – Data Encryption Standard – Block Cipher Design Principles and Modes of Operation - Evaluation criteria for AES – AES Cipher – Triple DES – Placement of Encryption Function – Traffic Confidentiality.

PUBLIC KEY CRYPTOGRAPHY :Key Management - Diffie-Hellman key Exchange – Elliptic Curve Architecture and Cryptography - Introduction to Number Theory – Confidentiality using Symmetric Encryption – Public Key Cryptography and RSA

AUTHENTICATION AND HASH FUNCTION :Authentication requirements – Authentication functions – Message Authentication Codes – Hash Functions – Security of Hash Functions and MACs – MD5 message Digest algorithm – Secure Hash Algorithm – RIPEMD – HMAC Digital Signatures – Authentication Protocols – Digital Signature Standard.

NETWORK SECURITY :Authentication Applications: Kerberos – X.509 Authentication Service – Electronic Mail Security – PGP – S/MIME – IP Security – Web Security

SYSTEM LEVEL SECURITY :Intrusion detection – password management – Viruses and related Threats – Virus Counter measures – Firewall Design Principles – Trusted Systems

Text Books :

1.William Stallings, "Cryptography and Network Security," 5th Edition, Pearson Education, (2010).
2. William Stallings, "Network Security and Essentials: Applications and Standards," 3rd Edition, Pearson Education.

Reference Books:

1. Wenbo Mao, "Modern Cryptography: Theory and Practice", 1st Edition, Pearson, (2003).
2.Neal Koblitz, "A Course on Number Theory & Cryptography," 2nd Edition, Springer, (1994).
3.Forouzon B, "Cryptography and Network Security," Indian Edition, TMH,(2010).
4.Bruice Schneier, "Applied Cryptography", 2nd Edition, Wiley,(2007).

PROFESSIONAL ELECTIVES

EMBEDDED SYSTEMS STREAM

ADVANCED EMBEDDED PROCESSOR ARCHITECTURES

Course code : 17 EM 3251 L – T – P**:** 3 –0 - 0

Pre Requisite :17EM3106 **Credits: 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Able to understand and analyze the 3 and 5 stage pipelines of ARM and able to program the ARM processor.	**PO6,PO5,PSO1**	**2**
CO2	Able to program the on chip & off chip peripherals of ARM 7 controller.	**PO6,PO5,PSO1**	**3**
CO3	Understand and analyze the AMBA bus architecture and different advanced ARM cores.	**PO6,PO5,PSO1**	**4**
CO4	Able to analyze the different SOC applications using ARM cores.	**PO6,PO5,PSO1**	**4**

SYLLABUS:

ARM Processor as System-on-Chip: Acorn RISC Machine – Architecture inheritance – ARM programming model – ARM development tools – 3 and 5 stage pipeline ARM organization – ARM instruction execution and implementation – ARM Co-processor interface. **ARM Assembly Language Programming:** ARM instruction types – data transfer, data processing and control flow instructions – ARM instruction set – Co-processor instructions, Thumb Instruction set. **Architectural Support for System Development:** Advanced Microcontroller bus architecture – ARM memory interface – ARM reference peripheral specification – Hardware system prototyping tools – ARMulator – Debug architecture. **ARM Processor Cores**: ARM7TDMI, ARM8, ARM9TDMI, ARM10TDMI, The AMULET Asynchronous ARM Processors-AMULET1. **Embedded ARM Applications**: The VLSI Ruby II Advanced Communication Processor, The VLSI ISDN Subscriber Processor, The OneCTM VWS22100 GSM chip, The Ericssion-VLSI Bluetooth Baseband Controller, The ARM7500 and ARM7500FE

Text Books

1.ARM System on Chip Architecture – Steve Furber – 2nd ed., 2000,Addison Wesley Professional.

2.Design of System on a Chip: Devices and Components – Ricardo Reis, 1st ed., 2004, Springer

Reference Books

1. Co-Verification of Hardware and Software for ARM System on Chip Design (Embedded Technology) – Jason Andrews – Newnes, BK and CDROM,2005.
2. System on Chip Verification – Methodologies and Techniques –Prakash Rashinkar, Peter Paterson and Leena Singh L, 2001,Kluwer Academic Publishers.

EMBEDDED LINUX

Course code :17 EM 4154 L – T – P **:** 3– 0- 0

Pre Requisite : 17EM3106 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Able to understand embedded Linux development environment, understand and create Linux BSP for a hardware platform.	**PO5,PO12,PSO1**	**2**
CO2	Able to program different embedded storage devices	**PO5,PO12,PSO1**	**3**
CO3	Able to understand the Linux model for embedded storage, understand and write various embedded Linux drivers such as serial, I^2C, and so on.	**PO5,PO12,PSO1**	**3**
CO 4	Able to port applications to embedded Linux and write real – time applications in embedded Linux.	**PO5,PO12,PSO1**	**6**

SYLLABUS:

Introduction: History of Embedded Linux, Embedded Linux versus Desktop Linux, Embedded Linux Distributions, Architecture of Embedded Linux, Linux Kernel Architecture, Linux Start-Up Sequence, GNU Cross-p\Platform Tool chain. Board Support Package: Inserting BSP in Kernel Build Procedure, Boot Loader Interface, Memory Map, Interrupt Management, PCI Subsystem, Timers, UART, and Power Management.

Embedded Storage: Flash Map, MTD—Memory Technology Device, MTD Architecture, Flash-Mapping Drivers, MTD Block and Character devices, Embedded File systems, Optimizing Storage Space**.**

Embedded Drivers: Linux Serial Driver, Ethernet Driver, I2C subsystem on Linux, USB Gadgets, Watchdog Timer, and Kernel Modules.

Porting Applications: Architectural Comparison, Application Porting Road Map, Programming with Pthreads, Operating System Porting Layer (OSPL), Kernel API Driver. Real-Time Linux: Linux and Real-Time, Real-Time Programming in Linux, Hard Real-Time Linux.

Text Books:

1.Embedded Linux System Design and Development, P.Raghavan, Amol Lad, SriramNeelakandan, 2006, Auerbach Publications

Reference Books:

Embedded Linux – Hardware, Software and Interfacing,2006.

NETWORKING OF EMBEDDED SYSTEMS

Course code :17 EM 4155 L – T – P **: 3 – 0 - 0**

Pre Requisite : 17EM3106 **Credits :3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Able to understand and develop applications using Rs-232C, RS-485 and SPI communication protocols.	**PO6,PO5,PSO1**	**2**
CO2	Able to understand and develop applications using I^2C, USB communication protocols.	**PO6,PO5,PSO1**	**2**
CO3	Able to understand and develop applications using CAN communication protocols	**PO6,PO5,PSO1**	**2**
CO4	Able to understand and analyze different wireless communication protocols used in Embedded Systems.	**PO6,PO5,PSO1**	**4**

SYLLABUS:

Networking through Native Serial Communications Systems: RS232 Standard: Features, Configuring UART port of 8051 and LPC 2148 and developing an application. RS 485: Features, Transmission Protocol, Developing an application using RS485 protocol. Synchronous Serial Protocols: Serial Peripheral Interface (SPI) – Features, Master Slave Configuration, Functional Discrepiction, SPL Developing an application using SPI communication interface.

Networking through Inter Integrated Communication (I2C): Drawbacks of RS232C, Features of I2C Starting and Stopping Communication, Receiving data from the Master, Interfacing devices on to the Bus, Acknowledging and Negative acknowledging, Arbitration and Synchronization, Addressing, Developing Applications using PIC based Microcontrollers. **Networking through USB bus:** Features of USB, Upward and Downward communications, USB device Identification, Speed Identification, Monitoring status of USB bus, Data Packet Identification, USB based data flow methods, Enumeration process for Interfacing USB devices on to the Bus, Configuring Descriptors, and Developing application using USB. **Networking through CAN Bus** – Features of CAN Protocols, Differentiating Data on CAN Bus, Bus Termination, CAN Communication Standard, Message Frames, Arbitration methods, Frame overloading, Bit stuffing, CAN identified errors, Normal Bit timing Computational Method, CAN Based Synchronization, Application development using PIC. **Wireless Embedded Networking:** Overview on wireless communication systems covering Wi-Fi, Bluetooth, Zigbee, NFC, Hi-Fi. Wireless sensor networks: Introduction, Applications, Network Topology, Localization, Time Synchronization, Energy efficient MAC protocols, SMAC, Energy efficient and robust routing, Data Centric routing

TEXT BOOKS:

1. Frank Vahid, Givargis 'Embedded Systems Design: A Unified Hardware/Software Introduction', Wiley Publications,2007.

2. Dogan Ibrahim, 'Advanced PIC microcontroller projects in C', Elsevier 2008

Reference Books:

1. Bhaskar Krishnamachari, 'Networking wireless sensors', Cambridge press 2005

SYSTEM ON CHIP ARCHITECTURES

Course code :17 EM 4156 L – T – P **:** 3- 0- 0
Pre Requisite : 17EM3106 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Able to understand and analyze different Design and Validation methodologies for logic cores such as memories, analog devices and SoCs.	**PO5,PO7,PSO1**	**4**
CO2	Able to understand On chip Communication Architecture Standards	**PO5,PO7,PSO1**	**2**
CO3	Able to analyze security issues of On chip Communication Architecture standards	**PO5,PO7,PSO1**	**4**
CO4	Able to understand and analyze different topologies of Networks on Chip.	**PO5,PO7,PSO1**	**4**

SYLLABUS:

Introduction, Design Methodology for Logic cores : SoC Design flow, General guide lines for design reuse, design process for soft, firm and hard cores, system integration. Design Methodology for Memory Cores and Analog cores: Design methodology for embedded memories, specifications of analog circuits.

Design Validation: core level validation, core interface verification, SoC design validation. On-chip communication Architectures: A quick overlook, Basic concepts of bus based communication Architectures: Terminology, characteristics of Bus based communication architectures, data transfer modes, Bus topology types.

On chip Communication Architecture Standard: standard on chip bus based communication architectures; socket based on chip interface standards.

Verification and security Issues in On chip communication Architectures: verification of on chip communication protocols, compliance verification for IP block integration, basic concepts for SoC security, security support in standard bus protocols,

Networks on chip: network topology, switching strategies, routing algorithms, flow control, clocking schemes, NOC architectures.

Text Books:

1. System On a Chip Design and Test? by Rochit Rajsuman, Library of Congress Cataloging-in-Publication Data,2000.
2. On chip communication Architectures? by Sudeep Pasricha and Nikil Dutt , Morgan Kaufmann Publishers,2008

HARDWARE SOFTWARE CO-DESIGN

Course code :17 EM 4157 L – T – P **:** 3 – 0 - 0
Pre Requisite : 17EM3106 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Understand and Analyze the co-design models like FSM, DFG and target architectures and use the tools required for	**PO12,PO5,PSO1**	**3**

	designing the hardware and software models		
CO2	Analyze Validation and Verification Techniques, design specification for embedded processor architectures	**PO12,PO5,PSO1**	**4**
CO3	Analyze the compilation techniques and tools for embedded processor architectures	**PO12,PO5,PSO1**	**4**
CO4	Understand the standard design methods like COSYMA system and LYCOS systems.	**PO12,PO5,PSO1**	**1**

SYLLABUS:

Introduction to HW-SW Co- Design: Meaning of HW-SW co-design, Co- Design Models, Architectures, Languages, A Generic Co-design Methodology. HW-SW Co-Synthesis.

Co- Synthesis Algorithms: Hardware software synthesis algorithms: hardware – Algorithms for software partitioning distributed system co-synthesis.

Prototyping and Emulation: Prototyping and emulation techniques, prototyping and emulation environments, future developments in emulation and prototyping.

Target Architectures: Architecture Specialization techniques, System Communication infrastructure, Target Architecture and Application System classes, Architecture for control dominated systems (8051-Architectures for High performance control), Architecture for Data dominated systems (ADSP21060, TMS320C60), Mixed Systems.

Compilation Techniques and Tools for Embedded Processor Architectures: Modern embedded architectures, embedded software development needs, compilation technologies practical consideration in a compiler development environment.

Design Specification and Verification: Design Specification: Design, co-design, the co-design computational model, concurrency coordinating, concurrent computations, interfacing components, **Verification:** Design verification, implementation verification, verification tools, interface verification

Languages for System – Level Specification and Design for homogenous systems System – level specification, design representation for system level synthesis, system level specification languages.

Languages for System – Level Specification and Design in respect of heterogeneous systems, Heterogeneous specifications and multi-language co-simulation the cosyma system and lycos system.

Text Books:

1.Hardware / software co- design Principles and Practice – Jorgen Staunstrup, Wayne Wolf – 2009, Springer.

2.Hardware / software co- design Principles and Practice, 2002, kluwer academic publishers

WIRELESS SENSOR STREAM

SENSORS AND SENSING PRINCIPLES

Course code : 17 EM 3252 L – T – P **:** 3 – 0 - 0

Pre Requisite :17CS3114 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Able to understand and analyze the sensor fundamentals, principles	**PO7,PO12**	**2**

	and characteristics		
CO2	Understand the application of various physical and Chemical sensors	**PO7,PO12**	**2**
CO3	Understand the application of various optical sensors	**PO7,PO12**	**2**
CO4	Able to understand the different bio sensors and its limitations.	**PO7,PO12**	**2**

SYLLABUS

Sensor Fundamentals: Basic sensor technology -sensor characteristics –static and dynamic – Principles of sensing- capacitance- magnetic and electromagnetic induction –resistance – piezoelectric effect –Pyroelectric effect -Hall effect- See beck and Pettier effect-heat transfer-light. Sensor Characteristics: Analysis of experimental data: causes and types of experimental errors – statistical analysis of experimental data –method of least squares –correlation coefficient, multivariable regression – graphical analysis and curve fitting. Physical /Chemical sensors: Position, Displacement and Level sensors, Velocity and Acceleration sensors, Force, Strain, Tactile and pressure sensors. Classification of chemical sensing Mechanism, Potentiometric sensors, Conduct metric Sensors, Amperometric Sensors, Enhanced Catalytic gas Sensors. Optical Sensors: Optical Radiation- Electromagnetic Spectrum, Snell's Law and Total internal reflection, Diffraction principles, Optical Detectors and Sources-Photo diodes and transistors, Photo-darling ton pairs, Photoconductive sensors, CCD sensors, Fiber optic sensors. Solid state light sources- LED , Diode lasers, Semiconductor laser optical cavity resonator. Bio sensors Origin and Transmission of bioelectrical Signals, The Electromyogram (EMG) & the Electrocardiogram (ECG) The Electroencephalogram (EEG) & Blood pressure measurement, Catalytic biosensors, mono-enzyme electrodes, bi-enzyme electrodes. cell based biosensors, biochips and biosensor arrays, problems and limitations.

Text books:

1. Biosensor Principles and Applications, Edited by Loïc J.Blum, Pierre R. Coulet Agarwal, Govind P, "fiber Optic Communication Systems", 2nd edition, Wiley, NewYork,1997
2. Principles of Biochemistry Albert L.Lehninger, David Lee Nelson,Michael M. 2005, Fourth Edition.
3. Sensors and Transducers D. Patranabis Prentice-Hall of India Pvt.Ltd August 15, 2004
4.Jacob Fraden, " Hand Book of Modern Sensors: physics, Designs and Applications",3rded.,Springer,2003.

WIRELESS COMMUNICATIONS & NETWORKS

Course code :17 EM 4158 L – T – P **:** 3 – 0- 0
Pre Requisite : 17CS3114 **Credits:3**
Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Able to understand Transmission fundamentals and communications networks and application protocol architecture	**PO7,PO12**	**2**
CO2	Able to understand and analyze signal encoding techniques, spectrum and different wireless networks	**PO7,PO12**	**2**
CO3	Able to understand and analyze various principles of cellular wireless networks	**PO7,PO12**	**2**

CO4	Able to understand wireless protocols and applications of IEEE802.11 architecture and standards	**PO7,PO12**	**2**

SYLLABUS:

Introduction- Wireless Comes of Age. The Cellular Revolution. The Global Cellular Network. Broadband. The Trouble with **Transmission Fundamentals** -Wireless Signals for Conveying Information. Analog and Digital Data Transmission. Channel Capacity. Transmission Media. Multiplexing. **Communication Networks-** LANs, MANs, and WANs. Switching Techniques. Circuit-Switching. Packet-Switching. Asynchronous Transfer mode. **Protocols and the TCP/IP Suite** - The Need for a Protocol Architecture. The TCP/IP Protocol Architecture. The OSI Protocol Architecture, internetworking. **WIRELESS COMMUNICATION TECHNOLOGY: Antennas and Propagation**- Antennas. Propagation Modes. Line-of-Sight Transmission. Fading in the Mobile Environment. **Signal Encoding Techniques-** Signal Encoding Criteria. Digital Data, Analog Signals. Analog Data, Analog Signals. Analog Data, Digital signals .**Spread Spectrum-** The Concept of Spread Spectrum. Frequency Hopping Spread Spectrum. Direct Sequence Spread Spectrum. Code-Division Multiple Access. Generation of Spreading Sequences. **Coding and Error Control- WIRELESS NETWORKING- Cellular Wireless Networks** Principles of Cellular Networks. First Generation Analog. Second Generation TDMA. Second Generation CDMA. Third Generation Systems . **Cordless Systems and Wireless Local Loop-** Cordless Systems. Wireless Local Loop. IEEE 802.16 Fixed Broadband Wireless Access Standard. **Mobile IP and Wireless Access Protocol-** Mobile IP. Wireless Application Protocol. **Wireless LAN Technology-** Overview. Infrared LANs. Spread Spectrum LANs. Narrowband Microwave LANs. **IEEE 802.11 Wireless LAN Standard-** IEEE 802 Protocol Architecture. IEEE 802.11 Architecture and Services. IEEE 802.11 Medium Access Control, IEEE 802.11 Physical Layer. **Bluetooth-** Overview. Radio Specifications. Baseband Specification. Link Manager Specification. Logical Link Control and adaptation protocol.

TEXTBOOKS:

1. William Stallings, "Wireless Communications and Networks", Pearson Education, 2005
2. Jochen Schiller, "Mobile Communications", Second Edition, Pearson Education, 2001.

REFERENCES:

1. Kaveh Pahlavan, Prasanth Krishnamoorthy, "Principles of Wireless Networks", First dition, Pearson Education, 2001.
2. Uwe Hansmann, Lothar Merk, Martin S. Nicklons and Thomas Stober, "Principles of Mobile Computing", Springer, 2001.

WIRELESS SENSOR NETWORKS.

Course code :17 EM 4159 L – T – P **:** 3 – 0 - 0

Pre Requisite : 17CS3114 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SLO	BTL
CO1	Able to understand Cellular and adhoc networks in detail	**PO5,PO12**	**2**
CO2	Able to understand wireless sensor networks data communications to other networks which involves its design and principles	**PO5,PO12**	**2**
CO3	Able to understand various MAC protocols for sensor networks	**PO5,PO12**	**2**
CO4	Able to understand and analyze various routing techniques of wsn and	**PO5,PO12**	**2**

	ad hoc networks		

SYLLABUS:

Cellular and Ad Hoc Wireless Networks-Applications of Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks: Medium Access Scheme-Routing-Multicasting Transport Layer Protocols-Pricing Scheme-Quality of Service Provisioning-Self Organization-Security-Addressing and Service Discovery-Energy management Scalability-Deployment Considerations, Ad Hoc Wireless Internet. **Comparison with Adhoc wireless networks**-Challenges for WSNs – Difference between sensor networks and Traditional sensor networks ,Types of Applications, Enabling Technologies for Wireless Sensor Networks –Single Node Architectures , Hardware Components , Energy Consumption of Sensor Nodes, Issues in Designing aMulticast Routing Protocol.**Data Dissemination**-Flooding and Gossiping-Data gathering Sensor Network Scenarios –Optimization Goals and Figures of Merit – Design Principles for WSNs Gateway Concepts – Need for gateway – WSN to Internet Communication –Internet to WSN Communication –WSN Tunneling**MAC Protocols for Sensor Networks** -Location Discovery-Quality of Sensor Networks Evolving Standards-Other Issues- Low duty cycle and wake up concepts- The IEEE802.15.4 MAC Protocols- Energy Efficiency -Geographic Routing Mobile nodes **Gossiping and Agent based Unicast Forwarding**-Energy Efficient Unicast-Broadcastand Multicast-Geographic Routing-Mobile nodes-Security-Application SpecificSupport - Target detection and tracking-Contour/ edge detection-Field Sampling.

Text Books:

1. Holger Karl and Andreas Wiilig, "Protocols and Architectures for Wireless Sensor Networks" John Wiley & Sons Limited 2008.
2. I.F .Akyildiz and Weillian, "A Survey on Sensor Networks",IEEE Communication Magazine, August 2007.

Reference Books:

1. Wilson , "Sensor Technology hand book," Elsevier publications 2005.
2. Anna Hac "Wireless Sensor Networks Design," John Wiley& Sons Limited Publications 2003.
3. C.Siva Ram Murthy and B.S.Manoj "Ad Hoc Wireless Networks," Pearson Edition 2005

SENSOR NETWORKS PROGRAMMING

Course code :17 EM 4160 L – T – P**: 3 – 0 - 0**

Pre Requisite : 17CS3114 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SLO	BTL
CO1	Able to understand fundamentals of TinyOS and nesC in wsn environment.	**PO5,PO12**	**1**
CO2	Able to understand real world programming of wireless sensor network in different scenarios.	**PO5,PO12**	**1**
CO3	Able to understand the performance analysis of power-aware algorithms	**PO5,PO12**	**1**
CO4	Able to understand and develop energy efficient algorithms for wireless sensor networks thru simulation or real time experiments	**PO5,PO12**	**2**

SYLLABUS

Introduction :Some Foundational Information , Next-Generation Sensor Networked Tiny Devices , Sensor Network Software Performance-Driven Network Software Programming ,Unique Characteristics of Programming Environments for Sensor Networks , Why TinyOS and NesC , Future Demands on Sensor-Based Software Wireless Sensor Networks :Sensor Network Applications ,Characteristics of Sensor Networks ,Nature of Data in Sensor Networks Sensor Technology: Sensor Level Server Level **,**Client Level **,**Programming Tools .**Tiny Operating System (TinyOS)** Components of TinyOS,An Introduction to NesC ,,Event-Driven Programming.Programming in NesC NesC Programming A Simple Program, SENSOR NETWORK IMPLEMENTATION. Sensor Programming :Programming Challenges in Wireless Sensor Networks,Sensing the World Applications Using the Interface SplitControl. **REAL-WORLD SCENARIOS**: Sensor Deployment Abstraction:Sensor Network Abstraction Data Aggregation ,Collaboration Group Abstractions ,Programming Beyond Individual Nodes 205 Standards for Building Wireless Sensor Network Applications :802.XX Industry Frequency and Data Rates ZigBee Devices and Components ZigBee Application Development Dissemination and Evaluation for Real-Time Environment Motivation and Background ,Software Microframework Requirements **Performance Analysis of Power-Aware Algorithms** : Introduction Service Architecture 242 Approaches To WSN Programmability ,Simulation Capabilities ,Benchmarking Modeling Sensor Networks Through Design and Simulation :Introduction, Why a New Simulator Currently Available Simulators ,Simulation Design ,Implementation Details ,Experimental Results

MATLAB Simulation of Airport Baggage-Handling System :Introduction, proposed Architecture

Text Books:

1.Fundamentals of Sensor Network Programming: Applications and Technology Hardcover Dec 2010 by S. Sitharama Iyengar ,Nandan Parameshwaran, Vir V. Phoha.

2.Fundamentals of Sensor Network Programming: Applications and Technology S. Sitharama Iyengar, Nandan Parameshwaran, Vir V. Phoha, N. Balakrishnan, Chuka D. Okoye ISBN: 978-0-470-87614-5

Reference Books:

Developing a Wireless Sensor Network Programming Language Application Guide Using Memsic Devices and LabVIEW

REMOTE SENSING

Course code : 17 EM 4161 L – T – P**:** 3 – 0 - 0

Pre Requisite : 17CS3114 **Credits:3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Able to understand relations of remote sensing with atmosphere and earth	**PO5,PO12**	**1**
CO2	Able to understand and remote sensing platforms and sensors for data analysis and interpretation	**PO5,PO12**	**1**
CO3	Understand the basic components of GIS	**PO5,PO12**	**1**
CO4	Understand data storage and analysis of GIS data.	**PO5,PO12**	**1**

SYLLABUS:

EMR AND ITS INTERACTION WITH ATMOSPHERE & EARTH MATERIAL: Definition of remote sensing and its components – Electromagnetic spectrum – wavelength regions important to remote sensing – Wave theory, Particle theory, Stefan-Boltzman and Wein's Displacement Law – Atmospheric scattering, absorption – Atmospheric windows – spectral signature concepts – typical spectral reflective characteristics of water, vegetation and soil.**PLATFORMS AND SENSORS** Types of platforms – orbit types, Sun-synchronous and Geosynchronous – Passive and Activesensors – resolution concept – Pay load description of important Earth Resources and Meteorological satellites – Airborne and spaceborne TIR and microwave sensors. IMAGEINTERPRETATIONANDANALYSIS Types of Data Products – types of image interpretation – basic elements of image interpretation- visual interpretation keys – Digital Image Processing – Pre-processing – image enhancement techniques – multispectral image classification – Supervised and unsupervised. **GEOGRAPHIC INFORMATION SYSTEM** Introduction – Maps – Definitions – Map projections – types of map projections – map analysis –GIS definition – basic components of GIS – standard GIS softwares – Data type – Spatial andnon-spatial (attribute) data – measurement scales – Data Base Management Systems (DBMS). **DATAENTRY, STORAGE AND ANALYSIS**Data models – vector and raster data – data compression – data input by digitization andscanning – attribute data analysis – integrated data analysis – Modeling in GIS Highway alignment studies – Land Information System.

TEXTBOOKS

1.Lillesand,T.M.,Kiefer,R.W.andJ.W.Chipman.(2004).RemoteSensingandImageInterpretation. V Edn.JohnWilleyandSons(Asia)Pvt.Ltd.,NewDelhi.

2. Anji Reddy, M. (2001). Textbook of Remote Sensing and Geographical Information System. Secondedn.BSPublications,Hyderabad.

REFERENCES

1. Lo. C.P.and A.K.W.Yeung (2002). Concepts and Techniques of Geographic Information Systems.Prentice-HallofIndiaPvt.Ltd.,NewDelhi.Pp:492.

2. Peter A.Burrough, Rachael A.McDonnell (2000). Principles of GIS. Oxford University Press.

3. Ian Heywood (2000). An Introduction to GIS. Pearson Education Asia.

WEB TECHNOLOGIES STREAM

WEB SERVICES

Course code : 17 EM 3253 L – T – P : 3-0-0

Pre Requisite :17EM3110 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Must be hands-on in developing two tier/ three tier WEB based applications using APACHE and NETBEANS as the Platform	PO5,PSO2	2
CO2	Must have theoretical knowledge of all the programming languages, WEB services related technologies and API as	PO5,PSO2	2

	detailed in the syllabus		
CO3	Able to understand fundamentals of SOAP,WSDL & UDDI	PO5,PSO2	1
CO4	Must be able to design, develop, register, deploy WEB Services and develop a real life application considering WEB services server and UDDI registry	PO5,PSO2	3

SYLLABUS:

Introduction: Introduction to Web Services, Web Service Architecture, XML Messaging, Service Description: WSDL, Service Discovery: UDDI, Service Transport, Using WEB service technologies together. Standards related to WEB service. **XML-RPC Essentials**: XML-RPC Overview, the need for XML-RPC, XML-RPC Technical Overview, Developing using XML-RPC, Beyond simple XML-RPC Calls. **SOAP Essentials**: SOAP 101, The SOAP Message, SOAP Encoding, SOAP via HTTP, SOAP and the W3C, SOAP Implementations, Using Apache SOAP: Installing Apache SOAP, Developing a simple SOAP message, Deploying SOAP Services, Programming using Apache SOAP: Working with Arrays, Working with JavaBeans, Working with Literal XML Documents, Handling SOAP Faults, Maintaining Session State. **WSDL**: The WSDL Specification, Basic WSDL Example: HelloService.wsdl, Invoking WSDL, Basic WSDL Invocation methods(Part-1) Xmethods, Basic WSDL Invocation methods (Part-2) Xmethods, Generating WSDL Files, XML Schema Data Typing. **UDDI Essentials**: Introduction to UDDI , UDDI Technical Overview, UDDI Data Model, Searching UDDI, Publishing to UDDI, UDDI Implementations, Web Resources, UDDI Inquiry API: The UDDI Inquiry API, Find Qualifiers, Finding and Retrieving UDDI Data, Publishing UDDI Data, UDDI4J Quick Reference API. **Developing Sample Applications using WEB services**: Income Tax Calculation, Purchase order processing, Invoicing and Billing

text Books :

Web Services Essentials By Ethan Cerami, Orielly ,2002.

Reference Books:

1.Java Web Services David A. Chappel & Jewell,Oreilly,2009.

2.Web Services Concepts, Architectures and applications by Gustavo Alonso.,Springer,2009.

WEB SEMANTICS

Course code : 17 EM 4162 L – T – P : 3-0-0

Pre Requisite : : 17EM3110 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Must Acquire theoretical knowledge related to WEB semantics, ontology learning and languages that can be used for the development of WEB semantics	PO5,PSO2	1
CO2	Must be knowledgeable using tools to develop web semantics for various real life applications	PO5,PSO2	2
CO3	Able to understand ontology Management & learning for semantic web	PO5,PSO2	1
CO4	Must develop a real life application that require use of WEB semantics	PO5,PSO2	3

SYLLABUS:

Introduction: Introduction to WEB semantics – Meaning and Reason. The Concept of Ontology, The langue of Ontology**,** Ontological Categories, Knowledge Representation Ontologies, Top Level Ontologies, Linguistic Ontologies, Domain Ontologies, Semantic Web: Need, Foundation, Layers, Architecture. **Languages for Semantic Web and Ontologies:** Web Documents in XML, RDF – Schema, Web Resource Description using RDF, RDF Properties, Topic Maps and RDF, RDF Overview, RDF Syntax Structure, RDF Semantics, RDF Pragmatics, Brief review of Traditional Ontology Languages: LOOM, OKBC,, OCML, F-logic Ontology, Brief review of Markup Languages: SHOE, OIL, DAML, OIL, OWL .**Ontology Learning for Semantic Web:** Taxonomy for Ontology Learning,– Layered Approach, Phases of Ontology Learning, Importing and Processing Ontologies and Documents, Ontology Learning Algorithms, Evaluation. **Ontology Management and Tools: N**eed for ontology management, development process, target ontology, ontology mapping, skills management system, ontological class, constraints, issues. Evolution, Development of Tools and Tool Suites, Ontology Merge Tools, Ontology based Annotation Tools. Use of Proteage tool for the development of Ontology. **Applications: Developing ontology for the** applications such as Insurance system, banking system and a Retail Trading System which are developed using various types of sources that of type structured, unstructured and semi-structured data (HTML. XML, RDBMS)

Text Books:

1.Asuncion Gomez-Perez, Oscar Corcho, Mariano Fernandez-Lopez "Ontological Engineering: with examples from the areas of Knowledge Management, eCommerce and the Semantic Web" Springer, 2004.

2.Grigoris Antoniou, Frank van Harmelen, "A Semantic Web Primer (Cooperative Information Systems)", The MIT Press, 2004.

Reference Books:

1.Alexander Maedche, "Ontology Learning for the Semantic Web", Springer; 1 edition, 2002.

2.John Davies, Dieter Fensel, Frank Van Harmelen, "Towards the Semantic Web: Ontology – Driven Knowledge Management", John Wiley & Sons Ltd., 2003.

3.John Davies (Editor), Rudi Studer (Co-Editor), Paul Warren (Co-Editor) "Semantic Web Technologies: Trends and Research in Ontology-based Systems"Wiley Publications, Jul 2006

4.Dieter Fensel (Editor), Wolfgang Wahlster, Henry Lieberman, James Hendler, "Spinning the Semantic Web: Bringing the World Wide Web to Its Full Potential", The MIT Press, 2002.

5.Michael C. Daconta, Leo J. Obrst, Kevin T. Smith, "The Semantic Web: A Guide to the Future of XML, Web Services, and Knowledge Management", Wiley, 2003.

ENTERPRISE PROGRAMMING

Course code :17EM4163 L – T – P : 3-0-0

Pre Requisite : 17EM3110 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Must acquire theoretical knowledge related to enterprise architectures, development platforms, Application servers, EJB components, EJB query language.	PO5,PSO2	2

CO2	Must be hands-on developing EJB components using NETBEANS and deploy the components using JBOSS	PO5,PSO2	2
CO3	Able to understand EJB QL & develop sample applications	PO5,PSO2	2
CO4	Must develop real life Enterprise wide application based on EJB and JBOSS and SQL server as DBMS engine	PO5,PSO2	6

SYLLABUS:

Introduction to Enterprise Systems: Meaning of an Enterprise, Difference between an enterprise and a business establishment, EE infrastructure support in JAVA. **Multi-Tier Architectures used for implementing IT for enterprises**: Single tier systems, Client server and N. Tier Architectures, Features of JAVA EE: Clients, servers, containers, Servlets, JSP, JDBC, EJBS, XML support, WEB services, Transaction support, Security, JAVA EE Architectures: client with EJB, JSP Client with EJB, Applet client with JSP and Database, WEB services oriented implementation. **Introduction to application server**: Meaning and purpose, Installing JBOSS, developing a sample EJB application and deploying under JBOSS and running the same: Introduction to component technologies, Role of Component technologies in implementing the Enterprise solutions, EJB Fundaments: EJB specification, Kinds of EJB. **EJB Session Beans:** Purpose, Meaning and Purpose of Stateful and Stateless session beans, Using Stateful and Stateless session beans, Sample application that uses a session bean. **SQL and EJB SQL**: Introduction to SQL, SQL Objects, SQL Data types, Creating Tables, Selecting Data from Tables, Modifying Table Data, Constructing Joins, Introduction to EJB QL: Entity Bean references, Javax.ejb.Query Object, Building EJB Queries, using relationships. **EJB Entity Beans**: Working of Entity beans with sessions beans, Anatomy of Entity bean, Entity Bean class, Managing persistence and Entity Manager Interface. **EJB Query Language**: EJB QL queries, running EJB QL within Session beans, Developing a sample application using Entity Beans. **EJB, EJB QL and JDBC:** Entity Bean relationships: One-to-Many, Many-to-many, Container managed relationships and EJB QL, Using JDBC with EJB Entity Beans, Message driven beans: Describing MDBs, MDB context, MDB Transactions, Invocation of an Interceptor, Java Message API, EJB Timer services, Developing a sample application using Message driven beans.

Text Books :

Kevin Mukhar and Chris Zelenak, "Beginning Java EE From Novice to professional, APRESS publications,2009.

Reference Books:

1.Antonio Goncalves, "Beginning Java™ EE 6 Platform with GlassFish™ 3 Novice to Professional", Apress, 2009 Edition

2.Jan Graba, "An Introduction to Network Programming with Java", Springer, 2nd edition, 2006.

3.Mark D Hansen, "SOA Using Java web services", Pearson, 2007.

4.Dreamtech Software Team, "Java Server Programming J2EE: Black Book", Wiley, 2007.

CLOUD BASED WEB DEVELOPMENT

Course code :17 EM 4164 L – T – P: 3-0-0

Pre Requisite : 17EM3110 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL

CO1	Must acquire theoretical knowledge related to WEB Applications, Cloud computing and deploying WEB applications on the cloud	PO5,PSO2	2
CO2	Must be hands-on developing WEB Applications using Google APP / Open ERA	PO5,PSO2	2
CO3	Able to understand basic cloud based application development environment	PO5,PSO2	2
CO4	Must be able to develop real life cloud based applications through Google APP / Open ERA	PO5,PSO2	6

SYLLABUS:

Web Application development: Overview: Architectures, Technologies: HTML, DHTML, PHP, JSP, JDBC, Overview on Enterprise development: Definition, Architectures, Technologies: Java.Net, Java. Tran, Java. Message, Application server. Component technologies: EJB specification, development, deployment, Developing Applications: WEB based and Enterprise based, Overview on WEB services: Architectures, Technologies. **Cloud computing fundamentals:** Cloud Computing definition, private, and public and hybrid cloud. Cloud based services ; IaaS, PaaS, SaaS. Benefits and challenges of cloud computing, public vs private clouds, role of virtualization in enabling the cloud; **Business Agility**: Benefits and challenges to Cloud architecture. Application availability, performance, security and disaster recovery; next generation Cloud Applications. **Deploying WEB services on the clouds:** Technologies and the processes required when deploying web services; deploying a web service from inside and outside a cloud architecture, advantages and disadvantages, **Management of WEB services hosted on the clouds:** Reliability, availability and security of services deployed from the cloud. Performance and scalability of services, tools and technologies used to manage cloud services deployment; Cloud Economics : Cloud Computing infrastructures available for implementing cloud based services. Economics of choosing a Cloud platform for an organization, based on application requirements, economic constraints and business needs (e.g Amazon, Microsoft and Google, Salesforce.com, Ubuntu and Redhat). **Cloud based application development environment:** Service creation environments to develop cloud based applications. Development environments for service development; Open ERA, Google App. Analysis of Case Studies when deciding to adopt cloud computing architecture. How to decide if the cloud is right for your requirements. Cloud based service, applications and development deployment so as to improve the total cost of ownership (TCO). **Cloud based WEB application development:** Technical architecture considerations – concurrency, speed and unpredictable loads. Agile development, team composition (including roles/responsibilities), working with changing requirements and aggressive schedules. Understanding Model View Controller (MVC). Advanced understanding of "views", location, and the presentation layer: Advanced Ajax and JQuery. Presenting to different browsers and devices. Localization and internationalization; Understanding client location and device type.

Text Books:

1.Gautam Shroff, "Enterprise Cloud Computing Technology Architecture Applications", Cambridge University Press; 1 edition, [ISBN: 978- 0521137355], 2010.

2.Toby Velte, Anthony Velte, Robert Elsenpeter, "Cloud Computing, A Practical Approach" McGraw-Hill Osborne Media; 1 edition [ISBN: 0071626948], 2009.

Reference Books:

1.Dimitris N. Chorafas, "Cloud Computing Strategies" CRC Press; 1 edition [ISBN: 1439834539],2010.
2.Eugenio Pace, Dominic Betts, Scott Densmore, Ryan Dunn, Masashi Narumoto, MatiasWoloski, "Developing Applications for the Cloud on the Microsoft Windows Azure Platform" Microsoft Press; 1 edition, [ISBN: 9780735656062] 2010.
3.Dan Wellman, "jQuery UI 1.6" Packt Publishing [ISBN: 9781847195128] 2009.
4.Peter Lubbers, Brian Albers, Frank Salem, Ric Smith, "Pro HTML5 Programming" A press, [ISBN: 9781430227908] 2010.
5.Lee Babin, "Beginning Ajax with PHP" A press; 1 edition, [ISBN: 9781590596678] 2000.

WEB ANALYTICS

Course code :17EM 4165 L – T – P: 3-0-0
Pre Requisite : 17EM3110 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Must acquire theoretical knowledge related to WEB Analytics, processing clicked streams, metrics for WEB analytics	PO5,PSO2	2
CO2	Must be hands-on developing WEB Analytics using NINJA	PO5,PSO2	2
CO3	Able to understand basics of analytics related to social,mobile & video.	PO5,PSO2	2
CO4	Must be able to develop applications that require WEB analytics	PO5,PSO2	4

SYLLABUS:

Introduction- Analytics – WEB Analytics – Meaning, State of WEB Analytics, Elements of WEB Analytics: Clicked streams, Analysis of Multiple Outcomes Analysis, Experimentation and Testing , including the Voice of Customer, Competitive Intelligence , The Strategic Imperative, Tactical Shift, Bonus Analytics. **Metrics for WEB analytics -** Eight Critical Web Metrics ,Visits and Visitors, Time on Page, Time on Site, Bounce Rate, Exit Rate, Conversion Rate, Engagement, Strategically-aligned Impactful Web Metrics, Diagnosing the Root Cause of a Metric's Performance: Conversion ,Leveraging Custom Reporting, Starting with Macro Insights. **Processing Clickstreams:** Web Analytics Primer, getting primitive indicators out of the way, Understanding Visitor Acquisition Strengths, Click Density Analysis, Counting user Visits for purchasing, Reporting Web Analytics, Sources of Traffic, Outcomes, Foundational Analytical Strategies, WEB segmenting, Capturing user Behavior, Analyzing everyday clickstreams, Site Search Analysis, Search Engine Optimization, Pay Per Click / Paid Search Analysis, Direct Traffic Analysis, Email campaign analysis, Rich experience analysis: Flash, Video, and Widgets, Reality Check: Prospect Perspectives on key web analytics challenges, visitor tracking cookies, data sampling, the value of historical data, the usefulness of video playback of customer experience ,the ultimate data reconciliation checklist. **Emerging Analytics related to Social, Mobile, and Video:** Measuring the new social web: The data challenge, the content democracy evolution ,The twitter revolution ,Analyzing offline customer experiences (Applications), Analyzing mobile customer experiences, **Mobile data collection:** Options,

Mobile Reporting and Analysis, Measuring the success of blogs, raw author contribution, Holistic audience growth, Citations and ripple index ,Cost of blogging, Benefit from blogging ,Quantifying the impact of twitter ,Growth in number of followers ,Message amplification ,Click-through rates and conversions, Conversation rate ,Emerging twitter metrics, Analyzing performance of Videos, Data collection for videos, Key video metrics and Analysis, Advanced video analysis. **Working with NINJA WEB Analytic tool –**Working with Ninja, Comparing Key Metrics, Performance analysis for different time periods, Providing context through segmenting, Comparing key metrics and segments against site average, Joining PALM (People Against Lonely Metrics) ,Leveraging Industry Benchmarks and Competitive Data, True Value: Measuring latent conversions and visitor behavior, Latent Visitor Behavior Latent Conversions, KPI Measurement Techniques ,Averages percentages ratios, Compound or Calculated Metrics, Searching: Achieving the optimal long-tail strategy, Computing head and tail, Understanding branding and category terms, The optimal search marketing strategy ,Executing the optimal long-tail strategy, Measuring the value of upper funnel keywords, Advanced pay-per-click analyses, Identifying keyword arbitrage opportunities

Text Books :

1."Web Analytics 2.0 The Art of Online Accountability & Science of Customer Centricity", Avinash Koushik, Wiley Publishing, Inc., ISBN: 978-0-470-52939-3.

Reference Books:

1."Advanced Web Metrics with Google Analytics™, Third Edition, B r i a n C l i f t o n John Wiley & Sons, Inc, ISBN: 978-1-118-16844-8.

INTERNET OF THINGS STREAM

WIRELESS TECHNOLOGIES FOR IOT

Course code :17EM4168 L – T – P: 3-0-0

Pre Requisite :17EM3106 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Remember and understand Radio Frequency (RF) Fundamentals	PO1,PSO1	1
CO2	Illustrate the various cellular standards	PO1,PSO1	1
CO3	Understand the different wireless technologies	PO1,PSO1	1
CO4	Understand the basics of embedded wireless application development.	PO5,PSO1	2

RF Basics: Radio Frequency (RF) Fundamentals: Introduction to RF & Wireless Communications Systems, RF and Microwave Spectral Analysis, Communication Standards, Understanding RF & Microwave Specifications. Spectrum Analysis of RF Environment, Protocol Analysis of RF Environment, Units of RF measurements, Factors affecting network range and speed, Environment, Line-of-sight, Interference, Defining differences between physical layers- OFDM.

Cellular Standards: Cellular carriers and Frequencies, Channel allocation, Cell coverage, Cell Splitting, Microcells, Picocells, Handoff, 1st, 2nd, 3rd and 4th Generation Cellular Systems (GSM, CDMA, GPRS, EDGE,UMTS), Mobile IP, WCDMA

WLAN: Wi-Fi Organizations and Standards: IEEE, Wi-Fi Alliance, WLAN Connectivity, WLAN QoS & Power-Save, IEEE 802.11 Standards,802.11- 2007,802.11a/b/g, 802.11e/h/I,802.11n

Wi-Fi Hardware & Software: Access Points, WLAN Routers, WLAN Bridges, WLAN Repeaters, Direct-connect Aps, Distributed connect Aps, PoE Infrastructure, Endpoint, Client hardware and software, Wi-Fi Applications

WSN & WPN: Wireless Personal Area Networks, Bluetooth, Bluetooth Standards, BlueTooth Protocol Architecture, UWB, IEEE 802.15 standards, ZigBee, Sub1GHz, Sensor Networks, co-existence strategies in Sensor Networks, Routing protocols in Wireless Sensor Networks.

TEXT BOOKS:

1. Wireless Communications – Principles and Practice; by Theodore S Rappaport, Pearson Education Pte. Ltd., Delhi
2. Wireless Communications and Networking; By: Stallings, William; Pearson Education Pte. Ltd., Delhi
3. Bluetooth Revealed; By: Miller, Brent A, Bisdikian, Chatschik; Addison Wesley Longman Pte Ltd., Delhi
4. Wilson , "Sensor Technology hand book," Elsevier publications 2005.
5. Andrea Goldsmith, "Wireless Communications," Cambridge University Press, 2005

REFERENCES:

1. Mobile and Personal Communications Services and Systems; 1st Edition; By: Raj Pandya; PHI, New Delhi
2. Fundamentals of Wireless Communication by Tse David and Viswanath Pramod, Cambridge University press, Cambridge
3. Mobile Communications; By: Schiller, Jochen H; Addison Wesley Longman Pte Ltd., Delhi
4. 3G Networks: Architecture, protocols and procedures based on 3GPP specifications for UMTS WCDMA networks, By Kasera, Sumit, Narang, and Nishit, TATA MGH, New Delhi
5. Wireless Sensor Networks: information processing by approach, ZHAO, FENG, GUIBAS and LEONIDAS J, ELSEVIER, New Delhi
6. Holger Karl and Andreas Wiilig, "Protocols and Architectures for Wireless Sensor Networks" John Wiley & Sons Limited 2008.

IOT APPLICATION DEVELOPMENT THROUGH PYTHON

Course code :17EM4169 L – T – P: 3-0-0

Pre Requisite :17EM3102 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
1	Understand the vision of IoT from a global context.	PO1,PO5	1
2	Understanding of Python Language and development boards.	PO1,PO5	1
3	Understanding and Building the application for IoT using Python.	PO2,PO5	1
4	Use of Devices, Gateways and cloud management in IoT.	PO5,PSO1	3

Understanding and Setting up the Base IoT Hardware, Understanding the Intel Galileo Gen 2 board and its components, Recognizing the Input/Output and the Arduino 1.0 pinout, Recognizing additional expansion and connectivity capabilities, Understanding the buttons and the LEDs.

. **Introduction to Python** - Language features of Python, Data types, data structures, Control of flow, functions, modules, packaging, file handling, data/time operations, classes, Exception handling Python packages - JSON, XML, HTTPLib, URLLib, SMTPLib. IoT Physical Devices and Endpoints.

Working with Python on Intel Galileo Gen 2 Setting up the board to work with Python as the programming language, Retrieving the board's assigned IP address ,Connecting to the board's operating system , Installing and upgrading the necessary libraries to interact with the board , Installing pip and additional libraries , Invoking the Python interpreter.

Interacting with Digital Outputs with Python Turning on and off and on board component , Prototyping with breadboards , Working with schematics to wire digital outputs , Counting from 1 to 9 with LEDs, Python code and the mraa library , Taking advantage of object-oriented code to control digital outputs , Improving our object-oriented code to provide new features Isolating the pin numbers to improve wirings , Controlling digital outputs with the wiring-x86 library.

Working with Digital Inputs, Polling and Interrupts Understanding pushbuttons and pullup resistors , Wiring digital input pins with pushbuttons , Reading pushbutton statuses with digital inputs and the mraa library , Reading pushbutton statuses and running a RESTful API ,Reading digital inputs with the wiring-x86 library , Using interrupts to detect pressed pushbuttons.

IoT Physical Servers and Cloud Offerings – Introduction to Cloud Storage models and communication APIs Webserver – Web server for IoT, Cloud for IoT, Python web application framework Designing a RESTful web API. Publishing data to the cloud with dweepy , Building a web-based dashboard with Freeboard , Sending and receiving data in real-time through Internet with PubNub , Publishing messages with commands through the PubNub cloud , Working with bi-directional communications , Publishing messages to the cloud with a Python PubNub client ,Using MQTT with Mosquitto and Eclipse Paho ,Publishing messages to a Mosquitto broker with a Python client.

REFERENCE BOOKS:

1. "Internet of Things with Python" Gastón C. Hillar,Published by Packt Publishing Ltd. Livery Place 35 Livery Street Birmingham B3 2PB, UK. ISBN 978-1-78588-138-1
2. Arshdeep Bahga and Vijay Madisetti,,Internet of Things - A Hands-on Approach, Universities Press, 2015, ISBN: 9788173719547 .
3. Matt Richardson & Shawn Wallace, Getting Started with Raspberry Pi, O'Reilly (SPD), 2014, ISBN: 9789350239759.
4. **"Learning Python"**, Fifth Edition by Mark Lutz, Published by O'Reilly Media, ISBN: 978-1-449-35573-9.

WIRELESS SENSOR NETWORKS.

Course code :17 EM 4159 L – T – P **:** 3 – 0 - 0

Pre Requisite : 17CS3002 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped SLO	BTL
CO1	Able to understand Cellular and adhoc networks in detail	**PO5,PO12**	**2**

CO2	Able to understand wireless sensor networks data communications to other networks which involves its design and principles	**PO5,PO12**	**2**
CO3	Able to understand various MAC protocols for sensor networks	**PO5,PO12**	**2**
CO4	Able to understand and analyze various routing techniques of wsn and ad hoc networks	**PO5,PO12**	**2**

Cellular and Ad Hoc Wireless Networks-Applications of Ad Hoc Wireless Networks, Issues in Ad Hoc Wireless Networks: Medium Access Scheme-Routing-Multicasting Transport Layer Protocols-Pricing Scheme-Quality of Service Provisioning-Self Organization-Security-Addressing and Service Discovery-Energy management Scalability-Deployment Considerations, Ad Hoc Wireless Internet. **Comparison with Adhoc wireless networks**-Challenges for WSNs – Difference between sensor networks and Traditional sensor networks ,Types of Applications, Enabling Technologies for Wireless Sensor Networks –Single Node Architectures , Hardware Components , Energy Consumption of Sensor Nodes, Issues in Designing aMulticast Routing Protocol.**Data Dissemination**-Flooding and Gossiping-Data gathering Sensor Network Scenarios –Optimization Goals and Figures of Merit – Design Principles for WSNs Gateway Concepts – Need for gateway – WSN to Internet Communication –Internet to WSN Communication –WSN Tunneling**MAC Protocols for Sensor Networks** -Location Discovery-Quality of Sensor Networks Evolving Standards-Other Issues- Low duty cycle and wake up concepts- The IEEE802.15.4 MAC Protocols- Energy Efficiency -Geographic Routing Mobile nodes **Gossiping and Agent based Unicast Forwarding**-Energy Efficient Unicast-Broadcastand Multicast-Geographic Routing-Mobile nodes-Security-Application SpecificSupport - Target detection and tracking-Contour/ edge detection-Field Sampling.

Text Books:

1. Holger Karl and Andreas Wiilig, “Protocols and Architectures for Wireless Sensor Networks” John Wiley & Sons Limited 2008.
2. I.F .Akyildiz and Weillian, “A Survey on Sensor Networks”,IEEE Communication Magazine, August 2007.

Reference Books:

1. Wilson , “Sensor Technology hand book,” Elsevier publications 2005.
2. Anna Hac “Wireless Sensor Networks Design,” John Wiley& Sons Limited Publications 2003.
3. C.Siva Ram Murthy and B.S.Manoj “Ad Hoc Wireless Networks,” Pearson Edition 2005

SENSORS AND SENSING PRINCIPLES

Course code : 17 EM 3252 L – T – P **:** 3 – 0 - 0
Pre Requisite : 17CS3002 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Able to understand and analyze the sensor fundamentals, principles and characteristics	**PO7,PO12**	**4**
CO2	Understand the application of various physical and Chemical sensors	**PO7,PO12**	**2**
CO3	Understand the application of various optical sensors	**PO7,PO12**	**2**
CO4	Able to understand the different bio sensors and its limitations.	**PO7,PO12**	**2**

Syllabus

Sensor Fundamentals: Basic sensor technology -sensor characteristics –static and dynamic – Principles

of sensing- capacitance- magnetic and electromagnetic induction –resistance – piezoelectric effect –Pyroelectric effect -Hall effect- See beck and Pettier effect-heat transfer-light. Sensor Characteristics: Analysis of experimental data: causes and types of experimental errors – statistical analysis of experimental data –method of least squares –correlation coefficient, multivariable regression – graphical analysis and curve fitting. Physical /Chemical sensors: Position, Displacement and Level sensors, Velocity and Acceleration sensors, Force, Strain, Tactile and pressure sensors. Classification of chemical sensing Mechanism, Potentiometric sensors, Conduct metric Sensors, Amperometric Sensors, Enhanced Catalytic gas Sensors. Optical Sensors: Optical Radiation- Electromagnetic Spectrum, Snell's Law and Total internal reflection, Diffraction principles, Optical Detectors and Sources-Photo diodes and transistors, Photo-darling ton pairs, Photoconductive sensors, CCD sensors, Fiber optic sensors. Solid state light sources- LED , Diode lasers, Semiconductor laser optical cavity resonator. Bio sensors

Origin and Transmission of bioelectrical Signals, The Electromyogram (EMG) & the Electrocardiogram (ECG) The Electroencephalogram (EEG) & Blood pressure measurement, Catalytic biosensors, mono-enzyme electrodes, bi-enzyme electrodes. cell based biosensors, biochips and biosensor arrays, problems and limitations.

Text books:

1. Biosensor Principles and Applications, Edited by Loïc J.Blum, Pierre R. Coulet Agarwal, Govind P, "fiber Optic Communication Systems", 2nd edition, Wiley, NewYork,1997

2. Principles of Biochemistry Albert L.Lehninger, David Lee Nelson,Michael M. 2005, Fourth Edition.

3. Sensors and Transducers D. Patranabis Prentice-Hall of India Pvt.Ltd August 15, 2004

4.Jacob Fraden, " Hand Book of Modern Sensors: physics, Designs and Applications",3rded.,Springer,2003.

FUNDAMENTALS OF IOT

Course code : 17 EM 3254 L – T – P **:** 3 – 0 - 0

Pre Requisite :17EM3102 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
1	Understand the basic concepts of IOTs & some related issues of IOTs	PO7,PSO1	2
2	Understand the Issues of Security, standards and Protocol Convergences with IOTs & Vision over M2M Vs. IOTs	PO7,PSO1	2
3	Understand the Architectural overview, Reference Models based Architecture of IOTs	PO7,PSO1	2
4	Analyze the IOT Smart Applications and Cloud support for IOT	PO7,PSO1	4

-Introduction- The IOT Today & Progression to Tomorrow – Success Factors –Vision – Strategic Research & Innovation Directions. **IOT and Related Issues -** IOTs & Related Future Internet Technologies – Networks & Communication – Processes & Data Management - Security, Privacy & Trust - Standardization - Protocol Convergence **M2M To IOT** -M2M Vs

IOT – A vision from M2M to IOT - M2M to IOT: An Architectural Overview. **Reference Model and IOT Architecture -** Architecture Reference Model – IOT Reference Architecture **IOT Applications , Cloud Service Management and IOT -** IOT Smart Applications - Connecting IOT to cloud – Cloud Storage for Iot – Data Analytics for IoT – Software & Management Tools for IOT.

TEXT BOOKS:

1. Ovidiu Vermesan, Peter Friess, "**Internet of Things – From Research & Innovation to Market Deployment**", River Publishers, 2014
2. Jan Ho¨ ller ,Vlasios Tsiatsis,Catherine Mulligan,Stamatis Karnouskos, Stefan Avesand, David Boyle, "**From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence**", Elsevier Ltd, 2014

REFERENCE BOOKS:

1. Arshdeep Bahga, Vijay Madisetti, "**Internet of Things – A hands-on approach**", Universities Press, 2015.
2. Manoel Carlos Ramon, "**Intel® Galileo and Intel® Galileo Gen 2: API Features and Arduino Projects for Linux Programmers**", Apress, 2014.
3. Marco Schwartz, "**Internet of Things with the Arduino Yun**", Packt Publishing, 2014

CYBER SECURITY STREAM

FUNDAMENTALS OF CYBER SECURITY

Course code :17EM3255 L – T – P: 3-0-0
Pre Requisite : 17CS3002 **Credits : 3**
Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Understand the need for cyber security and analyze the risk involved	PO4,PSO2	2
CO2	Analyze various types of security threats and electronic payment systems	PO4,PSO2	4
CO3	Analyze the security issues involved in developing secure information systems	PO4,PSO2	4
CO4	Analyze the security policies standards and cyber laws	PO4,PSO2	4

Introduction to information systems, Types of information Systems, Development of Information Systems, Introduction to information security, Need for Information security, Threats to Information Systems, Information Assurance, Cyber Security, and Security Risk Analysis.
Application security (Database, E-mail and Internet), Data Security Considerations-Backups, Archival Storage and Disposal of Data, Security Technology-Firewall and VPNs, Intrusion Detection, Access Control. Security Threats -Viruses, Worms, Trojan Horse, Bombs, Trapdoors, Spoofs, E-mail viruses, Macro viruses, Malicious Software, Network and Denial of Services Attack, Security Threats to E-Commerce Electronic Payment System, e- Cash, Credit/Debit Cards. Digital Signature, public Key Cryptography.
Developing Secure Information Systems, Application Development Security, Information Security Governance & Risk Management, Security Architecture & Design Security Issues in

Hardware, Data Storage & Downloadable Devices, Physical Security of IT Assets, Access Control, CCTV and intrusion Detection Systems, Backup Security Measures.
Security Policies, Why Policies should be developed, WWW policies, Email Security policies, Policy Review Process-Corporate policies-Sample Security Policies, Publishing and Notification Requirement of the Policies. Information Security Standards-ISO, IT Act, Copyright Act, Patent Law, IPR. Cyber Laws in India; IT Act 2000 Provisions, Intellectual Property Law: Copy Right Law, Software License, Semiconductor Law and Patent Law.

Text Books :

1. Charles P. Pfleeger, Shari Lawerance Pfleeger, "Analysing Computer Security ", Pearson Education India.
2. V.K. Pachghare, "Cryptography and information Security", PHI Learning Private Limited, Delhi India. 3.Dr. Surya Prakash Tripathi, Ritendra Goyal, Praveen kumar Shukla ,"Introduction to Information Security and Cyber Law" Willey Dreamtech Press.
4. Schou, Shoemaker, " Information Assurance for the Enterprise", Tata McGraw Hill.
5.Chander, Harish "Cyber Laws and its Protection" ,PHI.

MOBILE AND WIRELESS SECURITY

Course code :17EM4170 L – T – P: 3-0-0
Pre Requisite : 17CS3002 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Analyze the Security and Privacy aspects of Mobile and Wireless Networks	PO4,PSO2	4
CO2	Understand the mobile system architectures and related security issues	PO4,PSO2	2
CO3	Analyze the security issues in wireless networks	PO4,PSO2	4
CO4	Analyze RFID security and privacy issues	PO4,PSO2	4

Security and Privacy for Mobile and Wireless Networks: Introduction- State of the Art- Areas for Future Research- General Recommendation for Research. Pervasive Systems: Enhancing Trust Negotiation with Privacy Support: Trust Negotiation- Weakness of Trust Negotiation- Extending Trust Negotiation to Support Privacy
Mobile system architectures, Overview of mobile cellular systems, GSM and UMTS Security & Attacks, Vulnerabilities in Cellular Services, Cellular Jamming Attacks & Mitigation, Security in Cellular VoIP Services, Mobile application security.
Overview of Wireless security, Scanning and Enumerating 802.11 Networks, Attacking 802.11 Networks, Attacking WPA protected 802.11 Networks, Bluetooth Scanning and Reconnaissance, Bluetooth Eavesdropping, Attacking and Exploiting Bluetooth, Zigbee Security, Zigbee Attacks
Security in Ad Hoc Wireless Networks, Network Security Requirements, Issues and Challenges in Security Provisioning, Network Security Attacks, Key Management in Adhoc Wireless Networks, Secure Routing in Adhoc Wireless Networks
RFID Security and privacy, RFID chips Techniques and Protocols, RFID anti-counterfeiting, Man-in-the-middle attacks on RFID systems, Digital Signature Transponder, Combining Physics and Cryptography to Enhance Privacy in RFID Systems, Scalability Issues in Large-Scale Applications, An Efficient and Secure RFID Security Method with Ownership Transfer, Policy-based Dynamic Privacy Protection Framework leveraging Globally Mobile RFIDs, User-Centric

Security for RFID based Distributed Systems, Optimizing RFID protocols for Low Information Leakage, RFID: an anti-counterfeiting tool.

TEXT BOOKS

1.Kia Makki, Peter Reiher, "Mobile and Wireless Network Security and Privacy ", Springer, ISBN 978-0-387-71057-0, 2007.
2. C. Siva Ram Murthy, B.S. Manoj, "Adhoc Wireless Networks Architectures and Protocols", Prentice Hall, x ISBN 9788131706885, 2007.
3. NoureddineBoudriga, "Security of Mobile Communications", ISBN 9780849379413, 2010.
4. Kitsos, Paris; Zhang, Yan , "RFID Security Techniques, Protocols and System-On-Chip Design ", ISBN 978-0-387-76481-8, 2008.
5. Johny Cache, Joshua Wright and Vincent Liu," Hacking Wireless Exposed: Wireless Security Secrets & Solutions ", second edition, McGraw Hill, ISBN: 978-0-07-166662-6, 2010.

EMBEDDED SECURITY

Course code :17EM4173 L – T – P: 3-0-0

Pre Requisite :17EM3102 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Analyze the building blocks of embedded security applications	PO4,PSO2	4
CO2	Analyze the security requirements ,attacks and privacy solutions of embedded systems	PO4,PSO2	4
CO3	Analyze the hardware based content protection mechanisms	PO4,PSO2	4
CO4	Analyze the basic utilities of embedded security	PO4,PSO2	4

Security Development Life cycle, CVSS and its limitations. intel Embedded Solutions: from Management to Security Management .Engine : Overview, Platform and System Management, Intel AMT Overview,The Engine's Evolvement: from Management to Security, Security Applications at a Glance: EPID, PAVP, IPT and Boot Guard; Virtual Security Core: ARM Trust zone: secure and non-secure modes, memory isolation, bus isolation, physical verses virtual isolation . Management Engine vs. Intel AMT,Intel AMT vs. Intel vPro Technology. Building blocks of the security and the management engine: Random number generation, Message Authentication, RSA, Digital Signature, Secure storage,debugging.

Engine :Safeguarding itself Access to host memory, Security Requirements, Threat Analysis and Mitigation, Published Attacks: Introducing Ring-3 Rootkits.Intel's Enhanced Privacy Identification (EPID): Redefining Privacy for the Mobile Age, Processor Serial Number, EPID, Sign and Message Authentication(SIGMA)), Implementation of EPID, Applications of EPID, Next generation of EPID

Hardware-Based Content Protection Technology Introduction, Rights protections, Digital rights management (DRM), End-to-End Content Protection, Intel's Hardware-Based Content Protection, Intel Wireless Display, HDCP, Content Protection on TrustZone; Dynamically Loaded Applications:Closed-Door Model, Dynamic Application Loader (DAL) Overview, DAL Architecture, DAl Security Considerations.

Embedded Technology: Identity Protection Technology Isolated Computing Environment, Security-Hardening Measures, Basic Utilities of embedded security, Anonymous Authentication and Secure Session Establishment, Protected Input and Output, Dynamic Application Loader(DAL), Summary of Firmware Ingredients, Software Guard Extensions.

Text Books

1. Xiaoyu Ruan, Platform Embedded Security Technology Revealed, APress Open, 2014 ISBN 978-1-4302-6571-9. ebook: Platform Embedded Security Technology Revealed pdf

Reference Books:

Sl.No. Reference Books

1. Edward Lee, Sanjit Seshia, Introduction to Embedded Systems: A Cyber physical Systems Approach, ISBN 978-0-557-70857-4

COMPUTER FORENSICS

Course code :17EM4171 L – T – P: 3-0-0

Pre Requisite : 17CS3002 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Understand the principles and methodologies of digital forensics	PO4,PSO2	1
CO2	Analyze the techniques involveved in data acquisitions and duplication	PO4,PSO2	4
CO3	Analyze the vulnerabilities in routers	PO4,PSO2	4
CO4	Understand the basics of forensics acquisistion	PO4,PSO2	1

History of Forensics – Computer Forensic Flaws and Risks – Rules of Computer Forensics – Legal issues – Digital Forensic Principles – Digital Environments – Digital Forensic Methodologies. Live forensics and investigation –digital evidence – seizure methodology factors limiting the whole sale seizure of hardware- Demystifying computer/ cyber crime – explosion of networking – explosion of wireless networks – interpersonal communication.

Recovering deleted files and deleted partitions – deleted file recovery tools – deleted partitioned recovery tools – data acquisition and duplication – data acquisition tools – hardware tools – backing up and duplicating data.

An overview of Routers – Hacking Routers – Investigating Routers – Investigating Wireless Attacks – Basics of wireless – Wireless Penetration Testing – Direct Connections to Wireless Access Point – Wireless Connect to a Wireless Access Point.

Forensics Acquisition – Processing Local mail archives – Processing server level archives – classification of steganography – categories of steganography in Forensics – Types of password cracking.

TEXT BOOKS

1. Anthony Reyes, Jack Wiles, “Cybercrime and Digital Forenscis”, Syngress Publishers, Elsevier 2007.
2. John Sammons, “The Basics of Digital Forensics”, Elsevier 2012
3. Linda Volonins, Reynalds Anzaldua, “Computer Forensics for dummies”, Wiley Publishing 2008.

RISK MANAGEMENT AND SECURITY AUDIT

Course code :17EM4172 L – T – P: 3-0-0

Pre Requisite : 17CS3002 **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL

CO1	Understand the importance of information security risk assessment and data collection mechanisms	PO4,PSO2	1
CO2	Compile the risk score base don observations	PO4,PSO2	2
CO3	Analzye the risk priority and its consequences	PO4,PSO2	4
CO4	Perform Audit and follow up activities	PO4,PSO2	3

what is Risk? –Information Security Risk Assessment Overview- Drivers, Laws and Regulations- Risk Assessment Frame work – Practical Approach. The Sponsors- The Project Team- Data Collection Mechanisms- Executive Interviews- Document Requests- IT Assets Inventories- Profile & Control SurveyConsolidation. Compiling Observations- Preparation of catalogs- System Risk ComputationImpact Analysis Scheme- Final Risk Score. System Risk Analysis- Risk Prioritization- System Specific Risk Treatment- Issue Registers- Methodology- Result- Risk Registers- Post Mortem. Pre-planning audit- Audit Risk Assessment- Performing Audit- Internal ControlsAudit Evidence- Audit Testing- Audit Finding- Follow-up activities.

TEXT BOOKS

1. Mark Talabis, "Information Security Risk Assessment Toolkit: Practical Assessments through Data Collection and Data Analysis", Syngress; 1 edition, ISBN: 978-1-59749-735-0, 2012.

2. David L. Cannon, "CISA Certified Information Systems Auditor Study Guide", John Wiley & Sons, ISBN: 978-0-470-23152-4, 2009.

OPEN ELECTIVES

E-COMMERCE

Course Code : 17 EM 30B2 **L-T-P 3-0-0**

Prerequisite: Nil **Credits:** 3

Mapping of Course out comes with student out comes:

CO No.	Course outcome	Mapped PO	BTL
CO1	Analyze various E-Commerce Business Models and Infrastructure	PO7	4
CO2	Understand the Ethical, Social and Political issues in E-Commerce	PO8	1
CO3	Analyze Marketing communications and Internet resources for E-Commerce	PO5	4
Co4	Analyze the internet applications for commerce	PO5	4

SYLLABUS

Electronic Commerce: Revolution. E-Commerce Business models and concepts: The Internet and World Wide Web: E-commerce infrastructure. Building an E-commerce web site, online Security and payment systems, E-Commerce Marketing concepts, , Ethical, Social and Political issues in E-Commerce, Retailing on the Web, Online Service industries, B2B E-Commerce: Supply chain management and collaborative commerce. E-Commerce Marketing communications, Internet Resources for Commerce: Technologies for Web Servers, Internet Applications for commerce, Internet Charges, Internet Access and Architecture, Searching the Internet

Text Books:

1. Kenneth C.Laudon, Carol G.Traver , E-Commerce, (Pearson Education)

Reference Books:

1. Daniel Minoli,Emma Minoli,'Web Commerce Technology Handbook',(TMG)
2. Elias M.Awad'Electronic Commerce'(PHI)

INTERNET OF THINGS

Course code :17EM30B1 L – T – P: 3-0-0

Pre Requisite :NIL **Credits : 3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Understand the paradigm shift from M2M to IOT	PO7	1
CO2	Understand the fundamentals of IOT Technology	PO7	1
CO3	Understand the architecture of IOT	PO7	1
CO4	Understand the reference architecture of IOT	PO7	1

M2M to IoT-The Vision-Introduction, From M2M to IoT, M2M towards IoT-the global context, A use case example, Differing Characteristics.

M2M to IoT – A Market Perspective– Introduction, Some Definitions, M2M Value Chains, IoT Value Chains, An emerging industrial structure for IoT, The international driven global value chain and global information monopolies. **M2M to IoT-An Architectural Overview**– Building an architecture, Main design principles and needed capabilities, An IoT architecture outline, standards considerations.**M2M and IoT Technology Fundamentals-** Devices and gateways, Local and wide area networking, Data management, Business processes in IoT, Everything as a Service(XaaS), M2M and IoT Analytics, Knowledge Management.**IoT Architecture-State of the Art –** Introduction, State of the art, **Architecture Reference Model-** Introduction, Reference Model and architecture, IoT reference Model

IoT Reference Architecture- Introduction, Functional View, Information View, Deployment and Operational View, Other Relevant architectural views.

Textbook:

- Jan Holler, Vlasios Tsiatsis, Catherine Mulligan, Stefan Avesand, Stamatis Karnouskos, David Boyle, **"From Machine-to-Machine to the Internet of Things: Introduction to a New Age of Intelligence",** 1st Edition, Academic Press, 2014.

Reference Books:

- Vijay Madisetti and Arshdeep Bahga, **"Internet of Things (A Hands-on-Approach)",** 1stEdition, VPT, 2014.
- Francis daCosta, **"Rethinking the Internet of Things: A Scalable Approach to Connecting Everything",** 1st Edition, Apress Publications, 2013.

ELECTRONICS & COMPUTER SCIENCE ENGINEERING

B.TECH HONORS DEGREE SYLLABUS

SNO	COURSE CODE	COURSE NAME	L-T-P	CREDITS
	17EM5001	MICRO CONTROLLERS FOR EMBEDDED SYSTEM DESIGN	3-0-2	4
	17EM5002	REAL TIME CONCEPTS FOR EMBEDDED SYSTEMS	3-1-0	4

	17EM5003	**DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES**	**3-1-0**	**4**
	17EM5004	**SENSORS AND SENSING PRINCIPLES**	**3-1-0**	**4**
	17EM5005	**COMMUNICATION PROTOCOLS AND STANDARDS**	**3-1-0**	**4**

MICRO CONTROLLERS FOR EMBEDDED SYSTEM DESIGN

COURSE CODE: **17EM5001** L – T – P: 3-0-2
PRE-REQUISITE: NIL CREDITS: 4

Introduction to Embedded Systems
Overview of Embedded Systems, Processor Embedded into a system, Embedded Hardware Units and Devices in system, Embedded Software, Complex System Design, Design Process in Embedded System, Formalization of System Design, Classification of Embedded Systems.

Microcontrollers and Processor Architecture & Interfacing
8051 Architecture. Real world interfacing, Introduction to advanced architectures, processor & memory organization, Instruction-level parallelism, and performance metrics.

PIC Microcontroller Hardware
Introduction, Architectural overview, Memory organization, interrupts and reset, I/O ports, Timers

Device Drivers & Interrupt service Mechanism
Programmed-I/O Busy-wait approach without ISM,ISR concept, Interrupt sources, Interrupt service mechanism, Multiple Interrupts, context and the periods for context switching, Interrupt latency and deadline, Classification of processors ISM from context-saving angle, Direct Memory Access, Device driver programming

Devices &Communication Buses for Devices Network
IO Types and examples, Serial communication Devices, Parallel Device ports, Networked Embedded systems, Serial Bus communication protocols

Text Books:
1. Embedded Systems - Architecture Programming and Design – Raj Kamal, 2nd ed., 2008, TMH.
2. Embedded C Programming and the Microchip PIC-Richard Barnett, O" Cull, Cox, 2009,Cengage Learning.

Reference Books:
1. Embedded Microcomputer Systems, Real Time Interfacing – Jonathan W. Valvano – Brookes Cole, 1999, Thomas Learning

REAL TIME CONCEPTS FOR EMBEDDED SYSTEMS

COURSE CODE : 17EM-502 L – T – P: 3-1-0
PRE-REQUISITE: NIL CREDITS: 4

Introduction: Examples of Embedded Systems, Definition of Embedded Systems, Architecture of Embedded Systems, Real- Time Embedded Systems , Design Issues and Current Trends for Embedded Systems Hard versus soft Real- Time Systems: Jobs and Processes, Release Times, Deadlines and Timing Constraints, Hard and Soft Timing Constraints, Hard Real Time Systems, 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, Functional Parameters- preemptivity of jobs, criticality of jobs, Resource Parameters of Jobs and Parameters of Resources, Scheduling Hierarchy- Scheduler and Schedules, Feasibility, Optimality and Performance Measures.

Classification of Real Time Scheduling Approaches: Clock- Driven Approach, Weighted Round-Robin Approach, Priority- Driven Approach, Dynamic versus Static Systems, Effective Release Times and Deadlines, optimality of the EDF and LST algorithms, Non optimality of the EDF and LST algorithms, Challenges in validating timing constraints in priority –driven systems Off-line versus On-line Scheduling

Clock-Driven Scheduling : Notations and Assumptions, Static, Timer -Driven Scheduler, General Structure of Cyclic Schedules, Cyclic Executives, Improving the Average Response Time of Aperiodic Jobs, Scheduling Sporadic Jobs-Acceptance test ,EDF Scheduling of accepted jobs and implementation, Pros and Cons of Clock Driven Scheduling,

Priority-Driven Scheduling of Periodic Tasks: Static Assumption, Fixed Priority v/s Dynamic Priority Algorithms, schedulability test for the EDF algorithm, a schedulability test for fixed priority tasks with short response times-time demand analysis, schedulability test for fixed priority tasks with arbitrary response times: busy intervals, general schedulability test, sufficient schedulability conditions for RM & DM algorithms: schedulable utilization of the RM algorithm for tasks with Di=pi, schedulable utilization of fixed priority tasks with arbitrary relative deadlines Scheduling Aperiodic and Sporadic Jobs in Priority-Driven Systems: Assumptions and Approaches, Deferrable Servers- Operations of Deferrable Servers, Constant utilization server Scheduling of sporadic jobs-a simple acceptance test in deadline driven systems, a simple acceptance test in fixed- priority driven systems

Resources and Resource Access control: Assumptions on Resources and Their Usage, Effects of Resource Contention and Resource Access Control, Non-preemptive Critical Sections, Basic Priority Inheritance Protocol, Basic Priority Ceiling Protocol- Definition, computation of blocking time, controlling accesses to Multiple Unit Resources

Real-Time Operating Systems: Overview- Threads and Tasks, The Kernel, Time Services and Scheduling Mechanisms- Time Services, Scheduling Mechanisms, Other Basic Operating System Functions- Communication and Synchronization, Event Notification and Software Interrupt, Memory Management, I/O and Networking

TEXT BOOKS:

1. Real Time Systems – By Jane W.S.Liu -Low Price Edition , Pearson Education Asia
2. Real-Time Concepts for Embedded Systems - Qing Li with Caroline Yao published by CMP Books.

DIGITAL SIGNAL PROCESSORS AND ARCHITECTURES

COURSE CODE: **17EM 503** L – T – P: 3-1-0

PRE-REQUISITE: NIL CREDITS: 4

Introduction To Digital Signal Processing: Introduction, A Digital signal-processing system, The sampling process, Discrete time sequences. DiscreteFourier Transform (DFT) and Fast Fourier Transform (FFT), linear time-invariant systems, Digital filters, Decimation and interpolation.

Computational Accuracy in DSP Implementations: Number formats for signals and coefficients in DSP systems, Dynamic Range and Precision, Sources of errorin DSP implementations, A/D Conversion errors, DSP Computational errors, D/A Conversion Errors, Compensating filter.

Architectures for Programmable DSP Devices: Basic Architectural features, DSP Computational Building Blocks, Bus Architecture and Memory, Data Addressing Capabilities, Address Generation Unit, Programmability and Program Execution, Speed Issues, Features for External interfacing.

Programmable Digital Signal Processors: Commercial Digital signal-processing Devices, Data Addressing modes of TMS320C54XX DSPs, Data Addressing modes of TMS320C54XX Processors, Memory space of TMS320C54XX Processors, Program Control, TMS320C54XX instructions and Programming, On-Chip Peripherals, Interrupts of TMS320C54XX processors, Pipeline Operation of TMS320C54XX Processors.

Analog Devices Family of DSP Devices: Analog Devices Family of DSP Devices- ALU and MAC block diagram, Shifter Instruction, Base Architecture of ADSP2100, ADSP-2181 high performance Processor. Introduction to Blackfin Processor – The Blackfin Processor, Introduction to Micro Signal Architecture, Overview of Hardware Processing Units and Register files, Address Arithmetic Unit, Control Unit, Bus Architecture and Memory, Basic Peripherals.

Interfacing Memory And I/O Peripherals To Programmable DSP Devices: Memory space organization, External bus interfacing signals, Memory interface, Parallel I/O interface, Programmed I/O, Interrupts and I/O, Direct memory access (DMA).

Text Books

1. Digital Signal Processing – Avtar Singh and S. Srinivasan, Thomson Publications, 2004.
2. A Practical Approach to Digital Signal Processing – K Padmanabhan, R. Vijayarajeswaran, Ananthi.S, New Age International, 2006/2009.
3. Embedded Signal Processing with the Micro Signal Architecture Publisher: Woon-Seng Gan, Sen M. Kuo, Wiley-IEEE Press, 2007.

References

1. Digital Signal Processors, Architecture, Programming and Applications – B. Venkataramani and M. Bhaskar, 2002, TMH.
2. Digital Signal Processing – Jonatham Stein, 2005, John Wiley.
3. DSP Processor Fundamentals, Architecture & Features- Lapsley et al. 2000, S. Chand & Co.
4. Digital Signal Processing Applications Using the ADSP-2100 Family by The Applications Enguneering Staff of Analog Devices, DSP Division, Edited by Amy Mar, PHI.
5. The Scientist and Engineering's Guide to Digital Signal Processing by Steven W. Smith, Ph.D., California Technical Publishing, ISBN 0-9660176-3-3, 1997.
6. Embedded Media Processing by David J. Katz and Rick Gentile of Analog Devices, Newnes, ISBN 0750679123, 2005.

SENSORS AND SENSING PRINCIPLES

COURSE CODE: 17EM504 L – T – P: 3-1-0
PRE-REQUISITE: NIL CREDITS: 4

Sensor Fundamentals:

Basic sensor technology -sensor characteristics –static and dynamic –Principles of sensingcapacitance-
magnetic and electromagnetic induction –resistance piezoelectric effect –
Pyroelectric effect -Hall effect- See beck and Pettier effect-heat transfer-light. **Sensor Characteristics:** Analysis of experimental data: causes and types of experimental errors – statistical analysis of experimental data –method of least squares –correlation coefficient, multivariable regression – graphical analysis and curve fitting.

Physical /Chemical sensors: Position, Displacement and Level sensors, Velocity and Acceleration sensors,Force, Strain, Tactile and pressure sensors. Classification of chemical sensing Mechanism, Potentiometric sensors, Conduct metric Sensors, Amperometric Sensors, Enhanced Catalytic gas Sensors.

Optical Sensors: Optical Radiation- Electromagnetic Spectrum, Snell's Law and Total internal reflection, Diffraction principles, Optical Detectors and Sources-Photo diodes and transistors, Photo-darling ton pairs, Photoconductive sensors, CCD sensors, Fiber optic sensors. Solid state light sources- LED , Diode lasers, Semiconductor laser optical cavity resonator.

Bio sensors Origin and Transmission of bioelectrical Signals, The Electromyogram (EMG) & the Electrocardiogram (ECG) The Electroencephalogram (EEG) & Blood pressure measurement, Catalytic biosensors, mono-enzyme electrodes, bi-enzyme electrodes. cell based biosensors, biochips and biosensor arrays, problems and limitations.

Text books:

1. Biosensor Principles and Applications, Edited by Loïc J.Blum, Pierre R. Coulet Agarwal, Govind P, "fiber Optic Communication Systems", 2nd edition, Wiley, NewYork,1997
2. Principles of Biochemistry Albert L.Lehninger, David Lee Nelson,Michael M. 2005, Fourth Edition.
3. Sensors and Transducers D. Patranabis Prentice-Hall of India Pvt.Ltd August 15, 2004
4. Jacob Fraden, " Hand Book of Modern Sensors: physics, Designs and Applications", 3rd ed.,Springer, 2003.

COMMUNICATION PROTOCOLS AND STANDARDS

COURSE CODE: 17EM505 L – T – P: 3-1-0
PRE-REQUISITE: NIL CREDITS: 4

Networks in process automation

Networks in process automation: Information flow requirements, Hierarchical communication model, Data Communication basics, OSI reference model, Industry Network, Network Topologies.

Communication Protocols:

Communication Protocols: Communication Basics, Basics, Network Classification, Device Networks, Control Networks, Enterprise Networking, Network selection. Proprietary and open networks: Network Architectures, Building blocks

Wired Communication:

Wired: Wired Communication: Industry open protocols (RS-232C, RS- 422, RS-485), CAN bus, I2C, SPI, Ethernet,USB ,OFC, Modbus, Modbus Plus, Data Highway Plus, Advantages and Limitations of Open networks.

Fieldbus Trends

Fieldbus: Fieldbus Trends, Hardware selection, Fieldbus design, Installation, Documentation,Fieldbus advantages and limitations, Automotive Most bus, Hot standby router

protocol(HSRP) and Hot 255 modem, Dial up modem, Physical media -Cabling types and noise level conditions, leased line modems.

WPAN

Wireless: WPAN, Wi-Fi, Bluetooth, Zig-Bee, Z-wave, GPRS, GSM. Infrared communication: Routers, Hubs, Bridges, Ethernet switches, Different type of converters - Serial to Ethernet, Ethernet to OFC, Serial to OFC, RS232 to RS485

Text Books:

1. TCIP/IP protocol suite , Behrouz A. Forouzen, III Edition
2. Data communications, computer networks, open systems, Prakash C. Guptha, V Edition

ELECTRONICS AND COMPUTER SCIENCE ENGINEERING

MINOR DEGREE IN INTERNET OF THINGS

SNO	COURSE CODE	COURSE NAME	LTP	CREDITS
1	17EM6001	PRINCIPLES OF MICRO COMPUTER AND INTERFACES	3-0-0	3
2	17EM6002	EMBEDDED SYSTEMS DESIGN USING FPGA & VERILOG	3-0-0	3
3	17EM6003	MACHINE-TO-MACHINE COMMUNICATIONS	3-0-0	3
4	17EM6004	RFID AND SENSOR NETWORKS	3-0-0	3
5	17EM6005	THE CLOUD OF THINGS	3-0-0	3

PRINCIPLES OF MICRO COMPUTER AND INTERFACES

Course code : 17EM6001 L – T – P **:** 3-0-0
Pre Requisite :NIL **Credits :3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	Mapped PO	BTL
CO1	Understand transducers and 8086 processor	**7,12**	**2**
CO2	Understand signal processing and memory interfacing	**7,12**	**2**
CO3	Understand bus interfacing &Apply interfacing to the PC with keyboard, printer, motor using serial data communications	**7,12**	**2**

Syllabus:

Transducers: Transducers, Measurement systems, Temperature, Light, Position and motion, Force, pressure and flow.

Interfacing: Interfacing, Number systems, Computer architecture, Assembly language, Interfacing, A to D and D to A conversions, Data communications, Programmable logic controllers, Data acquisition project, 8086 assembly language programming.

Signal processing: Signal processing, Transfer function, Active filters, Instrumentation amplifier, Noise, Digital signal processing.

Memory and Memory interfacing: Semiconductor memory fundamentals, Memory address decoding, IBM PC Memory map, Data Integrity in RAM and ROM, 16-bit memory interfacing, ISA Bus memory interfacing,

I/O AND THE 8255; ISA BUS INTERFACING: 8088 I/O Instructions, I/O Address decoding and design, I/O Address Map of X86 PCS, 8255 PPI Chip, PC Interface Trainer And Bus Extender 325, I/O Programming with c/c++ and VB, 8-Bit And 16-Bit I/O Timing in ISA BUS.

Interfacing to the PC: LCD,MOTOR,ADC AND SENSOR: Interfacing an LCD to the PC**,** Interfacing a stepper motor to a PC, Interfacing DAC to a PC, Interfacing ADC And Sensors to the PC.

Serial data communication and the chips: Basics of serial communication, Accessing IBM pC com ports using DOS And BIOS, Interfacing the NS8250/16450 UART in the IBM PC, Intel 8251 USART And Synchronous Communication,

Keyboard And Printer Interfacing: Interfacing Keyboard to the cpu, PC Keyboard Interfacing And Programming, Printer And Printer Interfacing The IBM PC, Bidirectional Data Bus in Parallel ports,

ISA, EISA, MCA, LOCAL AND PCI BUS: ISA,EISA,AND IBM Micro Channel, VL Bus And PCI Local Buses,

Textbook:-

1. A.C.Fischer-Cripps,Newnes Interfacing Companion,science direct,2002.
2.The 80x86 IBM PC and Compatible Computers(volumes I&II),Assembly language,Design,and Interfacing,4th edition,Muhammad ali mazidi,Janice gillispie mazidi.2006.

Reference text books:

1. Toward Brain-computer Interfacing, Guido Dornhege, MIT Press, 2007.
2. A Friendly Guide to Computer Interfacing and LabVIEW Programming,John K. Eaton, Eaton, Oxford University Press, 1995.

EMBEDDED SYSTEMS DESIGN USING FPGA & VERILOG

Course code : 17EM6002 L– T – P **:3-0-0**

Pre Requisite :NIL Credits :3

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	MAPPED PO	BTL
CO1	Ability to use high-level hardware description languages such as Verilog for the design of ES	**5,7,12**	**3**
CO2	Understand system and spatial design	**5,7,12**	**2**
CO3	Understand and managing band width & Blocking versus non blocking assignment in verilog	**5,7,12**	**2**

Syllabus:

Introduction: Embedded Systems, Design Challenges, Platform FPGAs, Spectrometer Example, Introducing the Platform FPGA Tool Chain.

The Target: CMOS Transistor, Programmable Logic Devices, Field-Programmable Gate Array, Hardware Description Languages, From HDL to Configuration Bitstream, Xilinx Virtex 5, Xilinx Integrated Software Environment, Creating and Generating Custom IP. **System Design**: Principles of System Design, Control Flow Graph , Hardware Design, Software Design, Platform FPGA Architecture Design, Embedded GNU/Linux System. **Partitioning**: Overview of Partitioning Problem, Analytical Solution to Partitioning, Communication, Practical Issues, Profiling with Gprof , Linux Kernel. **Spatial Design**: Principles of Parallelism, Identifying Parallelism, Spatial Parallelism with Platform FPGAs, Useful VHDL Topics for Spatial Design, Debugging Platform FPGA Designs.**Managing Bandwidth**: Balancing Bandwidth, Platform FPGA Bandwidth Techniques, Scalable Designs, On-Chip Memory Access, Off-Chip Memory Access.**Outside World:** Point-to-Point Communication, Internetworking Communication, High-Speed Serial Communication, Low-Speed Communication, Generating the Hardware Base System, Testing the Design.**Selected Topics of Verilog**: Blocking versus non blocking assignment, Alternative coding style for sequential circuit, Use of the signed data type, Use of function in synthesis, Additional constructs for test bench development.

Text book:

1.Embedded systems design with FPGAs,principles and practices,Ron Sass and Andrew G.Schmidt.2005
2.embedded SoPC Design with NIOS II processor and verilog examples,pong p.chu(8th chapter).2005

Reference books

1. Embedded Systems Design with FPGAs by Peter Athanas, Dionisios Pnevmatikatos, Nicolas Sklavos, Springer .2006
2. Introduction to Embedded System Design Using Field Programmable Gate Arrays
By Rahul Dubey, Springer .2006

3.Embedded Core Design with FPGAs, Zainalabedin Navabi, McGraw Hill Professional, 13-Sep-2006

MACHINE-TO-MACHINE COMMUNICATIONS

Course code : 17EM6003 L – T – P **:3-0-0**

Pre Requisite :NIL **Credits:3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	MAPPED PO	BTL
CO1	Understand wireless technologies for the IOT	7,12	2
CO2	Design of M2M to IOT and its architectural overview	7,12	2
CO3	Understand the working principles of layers, and apply IOT to M2M to real-world problems	7,12	2

Syllabus:

Layer 1/2 connectivity: wireless technologies for the iot, layer 3 connectivity: ipv6 technologies for the iot, layer 3 connectivity: mobile ipv6 technologies for the iot, ipv6 over low-power wpan (6lowpan) introduction, the internet of things global context: m2m to iot , the vision, m2m to iot ,a market perspective, m2m to iot , an architectural overview. Nuts and bolts of m2m and iot: m2m and iot technology fundamentals, iot architecture, real-world design constraints. Implementation examples: asset management, industrial automation, the smart grid, commercial building automation, smart cities, participatory sensing, conclusion and looking ahead.

Textbook:

1. Daniel minoli ,Building the internet of things with ipv6 and mipv6: the evolving world of m2m communications,wiley,2013

Reference text books:

1. From Machine-to-Machine to the Internet of Things Introduction to a New Age of Intelligence, Jan Holler, Vlasios Tsiatsis,Catherine Mulligan.2012
2. The Internet of Things: Key Applications and Protocols By Olivier Hersent, David Boswarthick, Omar Elloumi, John Wiley & Sons.2012
3. Internet of Things: Converging Technologies for Smart Environments by Dr. Ovidiu Vermesan, Dr. Peter Friess, River Publishers.2013
4. Machine-to-machine (M2M) Communications: Architecture, Performance by Carles Anton-Haro, Mischa Dohler, Elsevier.2012

RFID AND SENSOR NETWORKS

Course code : 17EM6004 L – T – P**:** 3-0-0

Pre Requisite :NIL **Credits :3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	MAPPED PO	BTL
CO1	Understand Medium access controls in wireless networks	7,12	2
CO2	Design routing protocols for ad hoc and wireless sensor networks with respect to some protocol design issues	7,12	2
CO3	Understand RFID and security deployment & Apply RFID and Sensor networks on Health Care systems	7,12	2

Syllabus:

Medium Access Control in RFID, Anti-Collision Algorithm in RFID, Low-Power Transponders for RFID, EPCGen-2StandardforRFID, RFID Authentication and Privacy, RFID Deployment: Supply Chain Case Study, RFID Security, Geographic Routing in Wireless Sensor Networks, Medium Access Control in Wireless Sensor Networks, Localization in Wireless Sensor Networks, Data Aggregation in Wireless Sensor Networks, Clustering in Wireless Sensor Networks, Energy-Efficient Sensing in Wireless Sensor Networks, Mobility in Wireless Sensor Networks, Security in Wireless Sensor Networks, Network Management in Wireless Sensor Networks, Deployment in Wireless Sensor Networks, Integrated RFID and Sensor Networks: Architectures and Applications, Integrated RFID and Sensor Networks for Smart Homes, Integrated RFID and Sensor Networks for Health Care, Integrated RFID and Sensor Networks for Structure Monitoring

Textbooks:

1. RFID and Sensor Networks: Architectures, Protocols, Security, and Integrations

S. NO.	COURSE CODE	COURSE NAME	L-T-P	CR	PRE-REQ.	

edited by Yan Zhang, Laurence T. Yang, Jiming Chen, CRC Press.,2012

References:

1.Wireless Communication in Underground Mines: RFID-based Sensor Networking
By L. K. Bandyopadhyay, S. K. Chaulya, P. K. Mishra, Springer Science & Business Media. 2012

2. RFID-Enabled Sensor Design and Applications, By Amin Rida, Li Yang, Manos Tentzeris, Artech House.2012

3. RFID and the Internet of Things,Hervé Chabanne, Pascal Urien,Jean-Ferdinand Susini.2012.

THE CLOUD OF THINGS

Course code : 17EM6005 L – T – P : 3-0-0

Pre Requisite :NIL **Credits:3**

Mapping of course outcomes with student outcomes:

C.O. No.	Course outcome	MAPPED PO	BTL
CO1	Understand the fundamentals of Cloud Computing	7,12	2
CO2	Understand the Middle wares for Smart Objects and Smart Environments	7,12	2
CO3	Design Service-Oriented Discovery Framework for Cooperating Smart Objects & Apply cloud of things to Smart Grid Cities	7,12	2

Syllabus:

Middlewares for Smart Objects and Smart Environments: Overview and Comparison, Service-Oriented Middleware for the Cooperation of Smart Objects and Web Services, A Service-Oriented Discovery Framework for Cooperating Smart Objects, Smart Manufacturing Through Cloud-Based Smart Objects and SWE The Cloud of Things Empowered Smart Grid Cities The Third ICT Wave, Ubiquitous IoT Applications, Four Pillars of IoT, the DNA of IoT MIDDLEWARE FOR IoT: Middleware and IoT, Protocol Standardization for IoT, Architecture Standardization for WoT, THE CLOUD OF THINGS: Cloud Computing.

Reference books:

1. The internet things of things in the cloud a middleware perspective,honbo zhou,crc press .
2. Getting Started with the Internet of Things: Connecting Sensors and ...
By Cuno Pfister, "O'Reilly Media, Inc.".
3. Distributed and Cloud Computing: From Parallel Processing to the Internet of ...
By Kai Hwang, Jack Dongarra, Geoffrey C. Fox, Morgan Kaufmann.
4. Internet of Things Applications - From Research and Innovation to Market Deployment, Ovidiu Vermesan, Peter Friess,River Publishers

I		**HUMANITIES & SOCIAL SCIENCES**				
1	17 EN 1201	Building blocks for Communication Skills	0-0-4	2	NIL	
2	17 EN 3102	Instant Communication Skills	0-0-4	2	NIL	
3	17 EN 3203	Corporate Communication Skills	0-0-4	2	NIL	
4	17GN1001	Ecology and Environment	2-0-0	2	NIL	
5	17GN1002	Human Values	2-0-0	2	NIL	
				10		
II		**BASIC SCIENCES**				
1	17 MT 1102	Foundations of Computational Mathematics	3-0-0	3	NIL	
2	17 MT 1101	Single variable calculus and Matrix algebra	3-0-2	4	NIL	
3	17 MT 1203	Multivariate Calculus	3-0-2	4	NIL	
4	17MT2006	Probability and Stochastic Models	2-2-2	4	NIL	
5	17 PH 1001	Engineering Materials	3-0-2	4	NIL	
6	17 CY 1001	Engineering Chemistry	3-0-2	4	NIL	
7	17 MT 1204	Logic and Reasoning	3-0-0	3	NIL	
				26		
III		**ENGINEERING SCIENCES**				
1	17 EM 1101	Introduction to Electronics and Computer Science Engineering	2-0-2	3	NIL	
2	17 CS 1101	Problem Solving and Computer Programming	2-4-2	5	NIL	
3	17 CS 1102	Data Structures	2-4-2	5	17CS 1101	
4	17 ME 1002	Engineering Graphics	1-0-4	3	NIL	
5	17 GN 1003	Basic Engineering Measurements	2-0-2	3	NIL	
6	17CS2004	Object Oriented Programming	2-2-2	4	NIL	
7	17EM2102	Signals and Systems	2-2-2	4	NIL	

8	17 ME 1003	Workshop Practice	0-0-2	1	NIL	
9	17CS2005	Discrete Mathematics	3-1-0	4	NIL	
10	17 ME 1001	Engineering Mechanics	3-0-2	4	NIL	
				36		

PROFESSIONAL CORE COURSES						
1	17EM2103	Computer Organization	2--2--2	4	NIL	
2	17EM2204	Processors and Controllers	2--2--2	4	17EM2103	
3	17EM3205	FPGA based System Design	2--2--2	4	17EM2103	
4	17EM3106	Embedded System Design	2--2--2	4	17EM2204	
5	17EM2207	Electronic Devices and Circuits	2--2--2	4	NIL	
6	17EM3108	Linear Integrated Circuit Analysis	2--2--2	4	17EM2207	
7	17EM4109	Fundamentals of Communication Systems	2--2--2	4	17EM2102	
8	17CS2210	Database Management Systems	2--2--2	4	17CS1102	
9	17CS2008	Software Engineering	3--1--0	4	17CS2004	
10	17CS3113	Operating Systems	2--2--2	4	17EM2103/17CS2009	
11	17CS3114	Computer Networks	3--0--2	4	NIL	
12	17EM3110	Internet Programming	2--2--2	4	17CS2004	
13	17EM3211	Automata and Compiler Design	2--2--2	4	17CS2001	
14	17CS2211	Design and Analysis of Algorithms	2-2--2	4	17 CS1102	
15	17EM3112	Network Security	2-2--2	4	17CS3114	
				60		

PROFESSIONAL ELECTIVES

EMBEDDED SYSTEMS						
1	17EM3251	Advanced Embedded Processor Architecture	3--0—0	3		17EM3106
2	17EM4154	Embedded Linux	3--0—0	3		17EM3106
3	17EM4155	Networking of Embedded Systems	3--0—0	3		17EM3106

4	17EM4156	System on Chip Architectures	3--0—0	3		17EM3106
5	17EM4157	Hardware Software Co Design	3--0—0	3		17EM3106
WIRELESS SENSOR						
1	17EM3252	Sensors and Sensing Principles	3--0—0	3		17CS3114
2	17EM4158	Wireless Communications & Networks	3--0—0	3		17CS3114
3	17EM4159	Wireless Sensor Networks	3--0—0	3		17CS3114
4	17EM4160	Sensor Networks Programming	3--0—0	3		17CS3114
5	17EM4161	Remote Sensing and GIS	3--0—0	3		17CS3114
WEB TECHNOLOGIES						
1	17EM3253	Web Services	3--0—0	3		17EM3110
2	17EM4162	Web Semantics	3--0—0	3		17EM3110
3	17EM4163	Enterprise Programming	3--0—0	3		17EM3110
4	17EM4164	Cloud Based Web Development	3--0—0	3		17EM3110
5	17EM4165	Web Analytics	3--0—0	3		17EM3110
INTERNET OF THINGS						
1	17EM3254	Fundamentals of Internet of Things	3-0-0	3		17EM3106
2	17EM3252	Sensors and sensing principles	3-0-0	3		17CS3114
3	17EM4159	Wireless sensor networks	3-0-0	3		17CS3114
4	17EM4168	Wireless Technologies for IOT	3-0-0	3		17EM3106
5	17EM4169	IOT Application Programming Using Python	3-0-0	3		17EM3106
CYBER SECURITY						
1	17EM3255	Fundamentals of Cyber Security	3-0-0	3		17CS3114
2	17EM4170	Mobile and Wireless Security	3-0-0	3		17CS3114
3	17EM4171	Computer Forensics	3-0-0	3		17CS3114
4	17EM4	Risk Assessment and Security	3-0-0	3		17CS3114

	172	Audit				
5	17EM4173	Embedded Security	3-0-0	3		17CS3114
				15		

LIST OF OPEN ELECTIVES

1	17EM30B1	Internet of things	3-0-0	3	NIL	
2	17EM30B2	E-Commerce	3-0-0	3	NIL	
				6		

LIST OF MANAGEMENT ELECTIVES

1	17 MB 3051	Paradigms in Management thought	3-0-0	3	NIL
2	17 MB 3052	Indian Economy	3-0-0	3	NIL
3	17 MB 3053	Managing Personal Finances	3-0-0	3	NIL
4	17 MB 3054	Basics of Marketing for Engineers	3-0-0	3	NIL
5	17 MB 3055	Organization Management	3-0-0	3	NIL
6	17 MB 3056	Resources Safety and Quality Management	3-0-0	3	NIL
				3	

LIST OF FOREIGN LANGUAGES

1	17 GN 3051	Arabic	3-0-0	3	NIL
2	17 GN 3052	Bengali	3-0-0	3	NIL
3	17 GN 3053	Chinese	3-0-0	3	NIL
4	17 GN 3054	French	3-0-0	3	NIL
5	17 GN 3055	German	3-0-0	3	NIL
6	17 GN 3056	Hindi	3-0-0	3	NIL
7	17 GN 3057	Italian	3-0-0	3	NIL
8	17 GN 3058	Japanese	3-0-0	3	NIL
9	17 GN 3059	Kannada	3-0-0	3	NIL
10	17 GN 3060	Russian	3-0-0	3	NIL
11	17 GN 3061	Simhali	3-0-0	3	NIL
12	17 GN 3062	Spanish	3-0-0	3	NIL
13	17 GN 3063	Tamil	3-0-0	3	NIL
14	17 GN 3064	Urdu	3-0-0	3	NIL
				3	

TERM PAPER & PROJECT

1	17IE3247	Term Paper	0-0-4	2	NIL
2	17IE4048	Minor Project	0-0-4	2	NIL
3	17IE4050	Major Project	0-0-24	12	NIL
4	17IE2246	Industrial Training	0-0-4	2	NIL
5	17IE4049	Practice School	0-0-24	12	NIL
				18	

	CREDITS
HUMANITIES & SOCIAL SCIENCES	**10**
BASIC SCIENCES	**26**
ENGINEERING SCIENCES	**36**

PROFESSIONAL CORE	**60**
PROFESSIONAL ELECTIVES	**15**
MANAGEMENT ELECTIVES	**3**
OPEN ELECTIVES	**6**
FOREIGN LANGAUGES	**3**
TERM PAPER,MINOR,MAJOR PROJECT/PRACTISE SCHOOL	**18**
TOTAL CREDITS	**177**

Semester - I & II

S.No	Code	Course Title	L	T	P	Hours	Credits
1	17 MT 1101	Single Variable Calculus and Matrix Algebra	3	0	2	6	4
2	17 CS 1101	Problem solving and Computer Programming	2	4	2	6	5
3	17EM1101	Introduction to Electronics & Computer Engineering	2	0	2	2	3
4	17 MT 1102	Foundations of Computational Mathematics	3	0	0	4	3
5	17 ME 1002	Engineering Graphics	1	0	4	4	3
6	17 CY 1001	Engineering Chemistry	3	0	2	6	4
7	17 ME 1003	Workshop Practice	0	0	2	4	1
Total						32	23

S.No	Code	Course Title	L	T	P	Hours	Credits
1	17 MT 1203	Multivariate Calculus	3	0	2	6	4
2	17 CS 1102	Data Structures	2	4	2	6	5
3	17 EN 1201	Building blocks for Communication Skills	0	0	4	4	2
4	17 PH 1001	Engineering Materials	3	0	2	6	4
5	17GN 1003	Basic Engineering Measurements	2	0	2	2	3
6	17 MT1204	Logic & Reasoning	3	0	0	4	3
7	17 ME 1001	Engineering Mechanics	3	0	2	6	4
Total						34	25

Semester – III

S.No	Code	Course Title	L	T	P	Hours	Credits
1	17 EN 3102	Instant Communication Skills	0	0	4	4	2
2	17MT2006	Probability & Stochastic Models	2	2	2	6	4
3	17CS200	Object Oriented	2	2	2	6	4

Semester – IV

S.No	Code	Course Title	L	T	P	Hours	Credits
1	17 EN 3203	Corporate Communication Skills	0	0	4	4	2
2	17CS2005	Discrete Mathematics	3	1	0	6	4
3	17EM2	Electronic Devices and	2	2	2	6	4

	4	Programming					
4	17EM2103	Computer Organization	2	2	2	6	4
5	17CS2008	Software Engineering	3	1	0	6	4
6	17EM2102	Signals and Systems	2	2	2	6	4
Total						34	22

Semester – V

S.No	Code	Course Title	L	T	P	Hours	Credits
1	17GN1001	Ecology and Environment	2	0	0	2	2
2	17CS3113	Operating Systems	2	2	2	6	4
3	17CS3108	Linear Integrated Circuit Analysis	2	2	2	6	4
4	17EM3106	Embedded System Design	2	2	2	6	4
5	17CS3112	Network Security	2	2	2	6	4
6	17CS3110	Internet Programming	2	2	2	6	4
Total						30	22

	207	Circuits					
4	17EM2204	Processors and Controllers	2	2	2	6	4
5	17CS2210	Database management systems	2	2	2	6	4
6	17CS3114	Computer Networks	3	0	2	6	4
7	17IE2246	Industrial Training	0	0	0	0	2
Total						34	24

Semester – VI

S.No	Code	Course Title	L	T	P	Hours	Credits
1	17GN1002	Human values	2	0	0	2	2
2	17CS2211	Design and Analysis of algorithms	2	2	2	6	4
3	17EM3205	FPGA Based System Design	2	2	2	6	4
4	17EM3211	Automata & Compiler Design	2	2	2	6	4
5		Professional Elective -1	3	0	0	4	3
6		Management Elective-1	3	0	0	3	3
7	17IE3247	TERMPAPER	0	0	4	4	2

Total	31	22

Semester – VII							
S.No	**Code**	**Course Title**	**L**	**T**	**P**	**Hours**	**Credits**
1		Professional Elective -2	3	0	0	4	3
2		Professional Elective -3	3	0	0	4	3
3		Professional Elective -4	3	0	0	4	3
4		Professional Elective-5	3	0	0	4	3
5	17EM4109	Fundamentals of Communication Systems	2	2	2	6	4
6	17IE4048	MINOR PROJECT	0	0	4	4	2
7		Foreign language	3	0	0	4	3
Total						30	21

Semester – VIII							
S.No	**Code**	**Course Title**	**L**	**T**	**P**	**Hours**	**Credits**
1		Open Elective – 1	3	0	0	3	3
2		Open Elective – 2	3	0	0	3	3
3	17IE4050/ 17IE4049	Major Project / Practice School	0	0	16	16	12
Total						22	18

Semester - I	23
Semester – II	25
Semester – III	22
Semester – IV	24
Semester – V	24
Semester – VI	22
Semester – VII	21
Semester – VIII	16
Total	**177**