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THANJAVUR - 613 403 - TAMILNADU

School: ENGINEERING AND TECHNOLOGY

Dept: ECE- BTech (FT)

### Mapping of COs and Pos

#### 2020 regulation- UG (FT)

Sem	Course Code	Title of the Course	COs	POS												
				PO 1	PO 2	PO 3	PO 4	PO5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO12	
I	20147S11	Communicative English	<ul style="list-style-type: none"> <li>• Read articles of a general kind in magazines and newspapers.</li> <li>• Participate effectively in informal conversations; introduce themselves and their friends and express opinions in English.</li> <li>• Comprehend conversations and short talks delivered in English</li> <li>• Write short essays of a general kind and personal letters and emails in English.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

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	20148S12	Engineering Mathematics I	<ul style="list-style-type: none"> <li>• Use both the limit definition and rules of differentiation to differentiate functions.</li> <li>• Apply differentiation to solve maxima and minima problems.</li> <li>• Evaluate integrals both by using Riemann sums and by using the Fundamental Theorem of Calculus.</li> <li>• Apply integration to compute multiple integrals, area, volume, integrals in polar coordinates, in addition to change of order and change of variables.</li> <li>• Evaluate integrals using techniques of integration, such as substitution, partial fractions and integration by parts.</li> </ul>	✓	✓	✓	✓	✓		✓						✓
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*Srinilka*

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		<ul style="list-style-type: none"> <li>Determine convergence/divergence of improper integrals and evaluate convergent improper integrals.</li> <li>Apply various techniques in solving differential equations.</li> </ul>													
20149S13	Engineering Physics	<ul style="list-style-type: none"> <li>The students will gain knowledge on the basics of properties of matter and its applications,</li> <li>The students will acquire knowledge on the concepts of waves and optical devices and their applications in fibre optics,</li> <li>The students will have adequate knowledge on the concepts of thermal properties of materials and their applications in</li> </ul>	✓	✓	✓	✓		✓		✓		✓			

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		<p>expansion joints and heat exchangers,</p> <ul style="list-style-type: none"> <li>• The students will get knowledge on advanced physics concepts of quantum theory and its applications in tunneling microscopes, and</li> <li>• The students will understand the basics of crystals, their structures and different crystal growth techniques.</li> </ul>													
20149S14	Engineering Chemistry	<ul style="list-style-type: none"> <li>• The knowledge gained on engineering materials, fuels, energy sources and water treatment techniques will facilitate better understanding of engineering processes and applications for further learning.</li> </ul>	✓	✓	✓	✓				✓					✓

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20154S15	Engineering Graphics	<ul style="list-style-type: none"> <li>Familiarize with the fundamentals and standards of Engineering graphics</li> <li>Perform freehand sketching of basic geometrical constructions and multiple views of objects.</li> <li>Project orthographic projections of lines and plane surfaces.</li> <li>Draw projections and solids and development of surfaces.</li> <li>Visualize and to project isometric and perspective sections of simple solids.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
20150S16	Problem Solving and Basics of Python Programming	<ul style="list-style-type: none"> <li>Develop algorithmic solutions to simple computational problems</li> <li>Read, write, execute</li> </ul>	✓	✓	✓	✓	✓		✓						✓

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		<ul style="list-style-type: none"> <li>by hand simple Python programs.</li> <li>• Structure simple Python programs for solving problems.</li> <li>• Decompose a Python program into functions.</li> <li>• Represent compound data using Python lists, tuples, dictionaries.</li> <li>• Read and write data from/to files in Python Programs.</li> </ul>																
20150L17	Problem Solving and Basics of Python Programming Lab	<ul style="list-style-type: none"> <li>• Write, test, and debug simple Python programs.</li> <li>• Implement Python programs with conditionals and loops.</li> <li>• Develop Python programs step-wise by defining functions and calling them.</li> <li>• Use Python lists,</li> </ul>	✓	✓	✓	✓		✓		✓								

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		tuples, dictionaries for representing compound data. • Read and write data from/to files in Python.																	
20149L18	Physics and Chemistry Laboratory	Upon completion of the course, the students will be able to apply principles of elasticity, optics and thermal properties for engineering applications. • To make the student to acquire practical skills in the determination of water quality parameters through volumetric and instrumental analysis. • To acquaint the students with the determination of molecular weight of a	✓	✓	✓	✓					✓								✓

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			polymer by viscometry.															
	201AGIT	Induction Training Programme	<ul style="list-style-type: none"> <li>To learn about philosophy of Life and Individual qualities</li> <li>To learn and practice social values and responsibilities</li> <li>To learn and practice mind culture, forces acting on the body</li> <li>To learn more of Responsibilities and Rights as Professional and facing Global Challenges</li> <li>Emerge as responsible citizen with clear conviction to be a role-model in the society.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
II	20147S21	Technical English	<ul style="list-style-type: none"> <li>Read technical texts and write area- specific texts effortlessly.</li> <li>Listen and</li> </ul>	?	?	?	?	✓	✓	✓	✓	✓	✓	✓	✓	✓		

*S. Anitha*

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		<p>comprehend lectures and talks in their area of specialisation successfully.</p> <ul style="list-style-type: none"> <li>• Speak appropriately and effectively in varied formal and informal contexts.</li> <li>• Write reports and winning job applications.</li> </ul>											
20148S22	Engineering Mathematics II	<ul style="list-style-type: none"> <li>• Eigenvalues and eigenvectors, diagonalization of a matrix, Symmetric matrices, Positive definite matrices and similar matrices.</li> <li>• Gradient, divergence and curl of a vector point function and related identities.</li> <li>• Evaluation of line, surface and volume</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

*Pruthi*

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		<p>integrals using Gauss, Stokes and Green's theorems and their verification.</p> <ul style="list-style-type: none"> <li>Analytic functions, conformal mapping and complex integration.</li> <li>Laplace transform and inverse transform of simple functions, properties, various related theorems and application to differential equations with constant coefficients.</li> </ul>												
20149S23B	Physics for Electronics Engineering	<ul style="list-style-type: none"> <li>Gain knowledge on classical and quantum electron theories, and energy band structures,</li> <li>Acquire knowledge on basics of semiconductor physics and its applications in various</li> </ul>	✓	✓	✓	✓	✓		✓					✓

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		devices, • Get knowledge on magnetic and dielectric properties of materials, • Have the necessary understanding on the functioning of optical materials for optoelectronics, • Understand the basics of quantum structures and their applications in spintronics and carbon electronics.													
20153S24B	Circuit Analysis	• Understand the concept of three phase power circuits and measurement. • Comprehend the concepts in electrical generators, motors and transformers • Choose appropriate measuring instruments	✓	✓	✓	✓			✓		✓			✓	

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		for given application												
20153S25B	Basic Electrical And Instrumentation Engineering	<ul style="list-style-type: none"> <li>Develop the capacity to analyze electrical circuits, apply the circuit theorems in real time</li> <li>Design and understand and evaluate the AC and DC circuits.</li> </ul>	✓	✓	✓	✓					✓			✓
20152S26B	Electronic Devices	<ul style="list-style-type: none"> <li>Explain the V-I characteristic of diode, UJT and SCR</li> <li>Describe the equivalence circuits of transistors</li> <li>Operate the basic electronic devices such as PN junction diode, Bipolar and Field effect Transistors, Power control devices, LED, LCD and other Opto-electronic devices</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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	20154L27	Engineering Practices Laboratory	<ul style="list-style-type: none"> <li>• Fabricate carpentry components and pipe connections including plumbing works.</li> <li>• Use welding equipments to join the structures.</li> <li>• Carry out the basic machining operations</li> <li>• Make the models using sheet metal works</li> <li>• Illustrate on centrifugal pump, Air conditioner, operations of smithy, foundary and fittings</li> <li>• Carry out basic home electrical works and appliances</li> <li>• Measure the electrical quantities</li> <li>• Elaborate on the components, gates, soldering practices.</li> </ul>	✓	✓	✓	✓	✓		✓						✓
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*Srinidhi*

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20152L28B	Circuits and Devices Laboratory	<ul style="list-style-type: none"> <li>Analyze the characteristics of basic electronic devices</li> <li>Design RL and RC circuits</li> <li>Verify Thevinin &amp; Norton theorem KVL &amp; KCL, and Super Position Theorems</li> </ul>	✓	✓	✓	✓		✓		✓		✓				
201AGIC	Indian Constitution	<ul style="list-style-type: none"> <li>Understand the emergence and evolution of Indian Constitution.</li> <li>Understand the structure and composition of Indian Constitution</li> <li>Understand and analyse federalism in the Indian context.</li> <li>Understand and analyse the three organs of the state in the contemporary scenario.</li> </ul>	✓	✓	✓	✓			✓						✓	

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			<ul style="list-style-type: none"> <li>• Understand and Evaluate the Indian Political scenario amidst the emerging challenges.</li> </ul>											
	201ASBE	Basic Behavioral Etiquette	<ul style="list-style-type: none"> <li>• Explain the fundamental concepts of advanced algebra and their role in modern mathematics and applied contexts.</li> <li>• Demonstrate accurate and efficient use of advanced algebraic techniques.</li> <li>• Demonstrate their mastery by solving non-trivial problems related to the concepts and by proving simple theorems about the statements proven by the text.</li> <li>• Able to solve various</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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			types of partial differential equations. Able to solve engineering problems using Fourier series.																
III	20148S31B	Linear Algebra and Partial Differential Equations	<ul style="list-style-type: none"> <li>Identify the various control system components and their representations.</li> <li>Analyze the various time domain parameters.</li> <li>Analysis the various frequency response plots and its system.</li> <li>Apply the concepts of various system stability criterions.</li> <li>Design various transfer functions of digital control system using state variable models.</li> </ul>	✓	✓	✓	✓	✓	✓										✓

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20152S32	Control Systems Engineering	<ul style="list-style-type: none"> <li>• Implement linear and non-linear data structure operations using C</li> <li>• Suggest appropriate linear / non-linear data structure for any given data set.</li> <li>• Apply hashing concepts for a given problem</li> <li>• Modify or suggest new data structure for an application</li> <li>• Appropriately choose the sorting algorithm for an application</li> </ul>	✓	✓	✓	✓		✓		✓		✓					
20152S33	Fundamentals of Data Structures In C	<ul style="list-style-type: none"> <li>• Use digital electronics in the present contemporary world</li> <li>• Design various combinational digital circuits using logic gates</li> <li>• Do the analysis and</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		

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		<ul style="list-style-type: none"> <li>design procedures for synchronous and asynchronous sequential circuits</li> <li>• Use the semiconductor memories and related technology</li> <li>• Use electronic circuits involved in the design of logic gates</li> </ul>													
20152C34	Digital Electronics	<ul style="list-style-type: none"> <li>• To be able to determine if a given system is linear/causal/stable</li> <li>• Capable of determining the frequency components present in a deterministic signal</li> <li>• Capable of characterizing LTI systems in the time domain and frequency</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓					✓

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		domain																	
		<ul style="list-style-type: none"> <li>To be able to compute the output of an LTI system in the time and frequency domains</li> </ul>																	
20152C35	Signals and Systems	<ul style="list-style-type: none"> <li>Acquire knowledge of               <ul style="list-style-type: none"> <li>Working principles, characteristics and applications of BJT and FET</li> <li>Frequency response characteristics of BJT and FET amplifiers</li> </ul> </li> <li>Analyze the performance of small signal BJT and FET amplifiers - single stage and multi stage amplifiers</li> <li>Apply the knowledge gained in the design of Electronic circuits</li> </ul>	✓	✓	✓	✓		✓		✓									
20152C36	Electronic Circuits- I	<ul style="list-style-type: none"> <li>To understand and</li> </ul>	✓	✓	✓	✓													✓

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**Mapping of COs and Pos**

		implement basic data structures using C <ul style="list-style-type: none"> <li>To apply linear and non-linear data structures in problem solving.</li> <li>To learn to implement functions and recursive functions by means of data structures</li> <li>To implement searching and sorting algorithms</li> </ul>												
20152L37	Fundamentals of Data Structures In C Laboratory	<ul style="list-style-type: none"> <li>Design and Test rectifiers, filters and regulated power supplies.</li> <li>Design and Test BJT/JFET amplifiers.</li> <li>Differentiate cascode and cascade amplifiers.</li> <li>Analyze the limitation in bandwidth of single stage and multi stage</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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**Mapping of COs and Pos**

		<ul style="list-style-type: none"> <li>amplifier</li> <li>• Measure CMRR in differential amplifier</li> <li>• Simulate and analyze amplifier circuits using PSpice.</li> <li>• Design and Test the digital logic circuits.</li> </ul>													
20152L38	Analog and Digital Circuits Laboratory	<ul style="list-style-type: none"> <li>• Equip students with the English language skills required for the successful undertaking of academic studies with primary emphasis on academic speaking and listening skills.</li> <li>• Provide guidance and practice in basic general and classroom conversation and to engage in specific academic speaking activities.</li> <li>• improve general and</li> </ul>	✓	✓	✓	✓	✓								✓

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### Mapping of COs and Pos

		academic listening skills • Make effective presentations.																	
20152L39	Interpersonal Skills / Listening & Speaking	<ul style="list-style-type: none"> <li>Understand the fundamental knowledge of the concepts of probability and have knowledge of standard distributions which can describe real life phenomenon.</li> <li>Understand the basic concepts of one and two dimensional random variables and apply in engineering applications.</li> <li>Apply the concept random processes in engineering disciplines.</li> <li>Understand and apply the concept of correlation and spectral densities.</li> </ul>	✓	✓	✓	✓		✓		✓									

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### Mapping of COs and Pos

			<ul style="list-style-type: none"> <li>The students will have an exposure of various distribution functions and help in acquiring skills in handling situations involving more than one variable. Able to analyze the response of random inputs to linear time invariant systems.</li> </ul>																
	201AGGS	Introduction to Gender Studies	<ul style="list-style-type: none"> <li>Analyze different types of amplifier, oscillator and multivibrator circuits</li> <li>Design BJT amplifier and oscillator circuits</li> <li>Analyze transistorized amplifier and oscillator circuits</li> <li>Design and analyze feedback amplifiers</li> <li>Design LC and RC oscillators, tuned</li> </ul>	✓	✓	✓	✓					✓							✓

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### Mapping of COs and Pos

		amplifiers, wave shaping circuits, multivibrators, power amplifier and DC convertors.																
IV	20148S41B	Probability and Random Processes	<ul style="list-style-type: none"> <li>• Design AM communication systems</li> <li>• Design Angle modulated communication systems</li> <li>• Apply the concepts of Random Process to the design of Communication systems</li> <li>• Analyze the noise performance of AM and FM systems</li> <li>• Gain knowledge in sampling and quantization</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓				
	20152C42	Electronic Circuits II	<ul style="list-style-type: none"> <li>• Display an understanding of fundamental electromagnetic laws</li> </ul>	✓	✓	✓	✓	✓		✓								✓

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### Mapping of COs and Pos

		<ul style="list-style-type: none"> <li>and concepts</li> <li>• Write Maxwell's equations in integral, differential and phasor forms and explain their physical meaning</li> <li>• Explain electromagnetic wave propagation in lossy and in lossless media</li> <li>• Solve simple problems requiring estimation of electric and magnetic field quantities based on these concepts and laws</li> </ul>																
20152C43	Communication Theory	<ul style="list-style-type: none"> <li>• Design linear and non linear applications of OP – AMPS</li> <li>• Design applications using analog multiplier and PLL</li> <li>• Design ADC and DAC using OP – AMPS</li> <li>• Generate waveforms</li> </ul>	✓	✓	✓	✓		✓		✓								

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**Mapping of COs and Pos**

		using OP – AMP Circuits • Analyze special function Ics																		
20152C44	Electromagnetic Fields	One will obtain knowledge on the following after completing the course. • Public awareness of environmental is at infant stage. • Ignorance and incomplete knowledge has lead to misconceptions • Development and improvement in standard of living has lead to serious environmental disasters	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20152C45	Linear Integrated Circuits	• Analyze various types of feedback amplifiers • Design oscillators, tuned amplifiers, wave-	✓	✓	✓	✓	✓					✓								✓

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### Mapping of COs and Pos

		shaping circuits and multivibrators • Design and simulate feedback amplifiers, oscillators, tuned amplifiers, wave-shaping circuits and multivibrators using SPICE Tool.												
20149S46	Environmental Science and Engineering	• Design amplifiers, oscillators, D-A converters using operational amplifiers. • Design filters using op-amp and performs an experiment on frequency response. • Analyze the working of PLL and describe its application as a frequency multiplier. • Design DC power supply using ICs. • Analyze the	✓	✓	✓	✓		✓		✓		✓		

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### Mapping of COs and Pos

		performance of filters, multivibrators, A/D converter and analog multiplier using SPICE.													
20152L47	Circuits Design and Simulation Laboratory	<ul style="list-style-type: none"> <li>• Exposure to various research domains</li> <li>• Acquaintance with languages of research</li> <li>• Development for research aptitude</li> </ul>	✓	✓	✓	✓				✓					✓
20152L48	Linear Integrated Circuits Laboratory	<ul style="list-style-type: none"> <li>• Design PCM systems</li> <li>• Design and implement base band transmission schemes</li> <li>• Design and implement band pass signaling schemes</li> <li>• Analyze the spectral characteristics of band pass signaling schemes and their noise performance</li> <li>• Design error control</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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### Mapping of COs and Pos

			coding schemes											
201AGCE	Community Engagement	<ul style="list-style-type: none"> <li>Apply DFT for the analysis of digital signals and systems</li> <li>Design IIR and FIR filters</li> <li>Characterize the effects of finite precision representation on digital filters</li> <li>Design multirate filters</li> <li>Apply adaptive filters appropriately in communication systems</li> </ul>	<ul style="list-style-type: none"> <li>Describe data representation, instruction formats and the operation of a digital computer</li> <li>Illustrate the fixed point and floating-point arithmetic for ALU operation</li> </ul>	✓	✓	✓	✓	✓	✓					✓
201ASGS	Technical, General Aptitude and Skill set Development			✓	✓	✓	✓		✓	✓				

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### Mapping of COs and Pos

			<ul style="list-style-type: none"> <li>• Discuss about implementation schemes of control unit and pipeline performance</li> <li>• Explain the concept of various memories, interfacing and organization of multiple processors</li> <li>• Discuss parallel processing technique and unconventional architectures</li> </ul>												
V	20152C51	Digital Communication	Free Elective - I	✓	✓	✓	✓			✓					✓
	20152C52	Discrete-Time Signal Processing	<ul style="list-style-type: none"> <li>• Understand relational data model, evolve conceptual model of a given problem, its mapping to relational model and Normalization</li> <li>• Query the relational</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

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### Mapping of COs and Pos

		database and write programs with database connectivity • Understand the concepts of database security and information retrieval systems																
20152S53	Computer Architecture and Organization	• Articulate the main concepts, key technologies, strengths and limitations of cloud computing. • Learn the key and enabling technologies that help in the development of cloud. • Develop the ability to understand and use the architecture of compute and storage cloud, service and delivery models. • Explain the core issues of cloud computing such	✓	✓	✓	✓	✓		✓									✓

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**Mapping of COs and Pos**

		as resource management and security. • Be able to install and use current cloud technologies. • Choose the appropriate technologies, algorithms and approaches for implementation and use of cloud.																
201__OE54_	Open Elective – I																	
20152C55	Communication Networks	• To possess knowledge on nanotechnology based applications in each industry • To provide details of contemporary industrial applications of nanotechnology • To provide an overview of future						✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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### Mapping of COs and Pos

		technological advancements and increasing role of nanotechnology in each industry																	
20152L57	Digital Signal Processing Laboratory	<ul style="list-style-type: none"> <li>• Can carry out energy accounting and balancing</li> <li>• Can suggest methodologies for energy savings</li> </ul>			✓	✓	✓	✓	✓			✓							
20152L58	Communication Systems Laboratory	<ul style="list-style-type: none"> <li>• Understanding the physics of solar radiation.</li> <li>• Ability to classify the solar energy collectors and methodologies of storing solar energy.</li> <li>• Knowledge in applying solar energy in a useful way.</li> <li>• Knowledge in wind energy and biomass with its economic</li> </ul>			✓	✓	✓	✓			✓		✓						✓

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**Mapping of COs and Pos**

		aspects. • Knowledge in capturing and applying other forms of energy sources like wind, biogas and geothermal energies.																		
20152L59	Communication Networks Laboratory	• Identify the different components in automobile engineering. • Have clear understanding on different auxiliary and transmission systems usual.			✓	✓	✓	✓						✓						
20152E56A	Object Oriented Programming	• An understanding of the nature and characteristics of air pollutants, noise pollution and basic concepts of air quality management • Ability to identify,			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓

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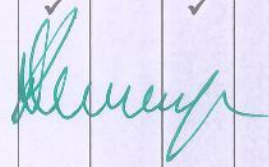


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**Mapping of COs and Pos**

			formulate and solve air and noise pollution problems • Ability to design stacks and particulate air pollution control devices to meet applicable standards. • Ability to select control equipments. • Ability to ensure quality, control and preventive measures.													
			• Have basic idea about the fundamentals of GIS. • Understand the types of data models. • Get knowledge about data input and topology. • Gain knowledge on data quality and standards. • Understand data			✓	✓	✓	✓	✓		✓				

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**Mapping of COs and Pos**

		management functions and data output																		
20152E56C	Operating Systems	<ul style="list-style-type: none"> <li>Identify the components required to build different types of networks</li> <li>Choose the required functionality at each layer for given application</li> <li>Identify solution for each functionality at each layer</li> <li>Trace the flow of information from one node to another node in the network</li> </ul>			✓	✓	✓	✓		✓		✓								✓
20152E56D	Robotics and Automation	<b>Elective - I</b>			✓	✓	✓	✓				✓								
20152E56E	Nano Technology and Applications	<ul style="list-style-type: none"> <li>Know the human body electro- physiological parameters and recording of bio-</li> </ul>			✓	✓	✓	✓		<i>[Signature]</i>	✓	✓	✓	✓	✓					✓

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## Mapping of COs and Pos

potentials

- Comprehend the non-electrical physiological parameters and their measurement – body temperature, blood pressure, pulse, blood cell count, blood flow meter etc.
- Interpret the various assist devices used in the hospitals viz. pacemakers, defibrillators, dialyzers and ventilators
- Comprehend physical medicine methods eg. ultrasonic, shortwave, microwave surgical diathermies, and bio-telemetry principles and methods
- Know about recent trends in medical

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### Mapping of COs and Pos

		instrumentation																	
		<ul style="list-style-type: none"> <li>Describe the basic science behind the properties of materials.</li> <li>Interpret the creation, characterization, and manipulation of nanoscale materials.</li> <li>Comprehend the exciting applications of nanotechnology at the leading edge of scientific research</li> <li>Apply their knowledge of nanotechnology to identify how they can be exploited for new applications.</li> </ul>			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20152E56G	Total Quality Management				✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20152E56F	Human Rights	<ul style="list-style-type: none"> <li>The student would be able to apply the tools and techniques of quality management to manufacturing and</li> </ul>			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

*Sanitha*

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### Mapping of COs and Pos

			services processes.															
VI	20152C61	Microprocessors and Microcontrollers	<ul style="list-style-type: none"> <li>Analyze the type of dither.</li> <li>Analyze the recording and transmission principles in digital audio.</li> <li>Analyze the various compression techniques.</li> <li>Design and analyze the digital audio editing.</li> <li>Analyze the various application of digital audio.</li> </ul>			✓	✓	✓	✓	✓								✓
	20152C62	VLSI Design	<ul style="list-style-type: none"> <li>Ability to understand and analyze Instrumentation systems and their applications to various industries.</li> <li>Ability to understand and analyse, linear and</li> </ul>			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓

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### Mapping of COs and Pos

		digital electronic circuits.																		
20152C63	Wireless Communication					✓	✓	✓	✓	✓			✓							
20152S64	Principles of Management					✓	✓	✓	✓			✓			✓					✓
20152C65	Transmission Lines and RF Systems					✓	✓	✓	✓				✓							
<b>20152E66_</b>	<b>Elective – II</b>																			
20152L61	Microprocessors and Microcontrollers Laboratory	<ul style="list-style-type: none"> <li>• Carryout basic signal processing operations</li> <li>• Demonstrate their abilities towards MATLAB based implementation of various DSP systems</li> <li>• Analyze the architecture of a DSP Processor</li> <li>• Design and Implement the FIR and IIR Filters in DSP Processor for performing filtering</li> </ul>				✓	✓	✓	✓	✓	✓	✓	✓	✓						✓

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## Mapping of COs and Pos

		operation over real-time signals • Design a DSP system for various applications of DSP											
20152L62	VLSI Design Laboratory	<ul style="list-style-type: none"> <li>• Simulate &amp; validate the various functional modules of a communication system</li> <li>• Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes</li> <li>• Apply various channel coding schemes &amp; demonstrate their capabilities towards the improvement of the noise performance of communication system</li> <li>• Simulate end-to-end</li> </ul>			✓	✓	✓	✓	✓	✓	✓	✓	✓

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**Mapping of COs and Pos**

		communication Link																
20152L63	Professional Communication	<ul style="list-style-type: none"> <li>• Communicate between two desktop computers</li> <li>• Implement the different protocols</li> <li>• Program using sockets.</li> <li>• Implement and compare the various routing algorithms</li> <li>• Use the simulation tool.</li> </ul>			✓	✓	✓	✓	✓		✓	✓						✓
20152L64	Technical Seminar	<ul style="list-style-type: none"> <li>• Understand the approaches towards and constraints in good research. Use the statistical tools used in research methodology</li> <li>• Compose the manuscript for publication</li> <li>• Obtain computational</li> </ul>			✓	✓	✓	✓			✓	✓						✓

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### Mapping of COs and Pos

		and excel- skills for research in engineering																
20152E66A	Cryptography and Network Security	<ul style="list-style-type: none"> <li>Understand and execute programs based on 8086 microprocessor.</li> <li>Design Memory Interfacing circuits.</li> <li>Design and interface I/O circuits.</li> <li>Design and implement 8051 microcontroller based systems.</li> </ul>			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20152E66B	Advanced Digital Signal Processing	<ul style="list-style-type: none"> <li>Realize the concepts of digital building blocks using MOS transistor.</li> <li>Design combinational MOS circuits and power strategies.</li> <li>Design and construct Sequential Circuits and Timing systems.</li> <li>Design arithmetic</li> </ul>			✓	✓	✓	✓	✓				✓	✓				✓

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**Mapping of COs and Pos**

		<ul style="list-style-type: none"> <li>building blocks and memory subsystems.</li> <li>• Apply and implement FPGA design flow and testing.</li> </ul>													
20152E66C	MEMS and NEMS	<ul style="list-style-type: none"> <li>• Characterize a wireless channel and evolve the system design specifications</li> <li>• Design a cellular system based on resource availability and traffic demands</li> <li>• Identify suitable signaling and multipath mitigation techniques for the wireless channel and system under consideration.</li> </ul>			✓	✓	✓	✓	✓		✓	✓			✓
20152E66D	Multimedia Compression and Communication	<ul style="list-style-type: none"> <li>• Upon completion of the course, students will be able to have clear understanding</li> </ul>			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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		<ul style="list-style-type: none"> <li>• Managerial functions like planning, organizing, staffing, leading &amp; controlling and have same basic knowledge on international aspect of management</li> </ul>																	
	20152E66E	CMOS Analog IC Design	<ul style="list-style-type: none"> <li>• Explain the characteristics of transmission lines and its losses</li> <li>• Write about the standing wave ratio and input impedance in high frequency transmission lines</li> <li>• Analyze impedance matching by stubs using smith charts</li> <li>• Analyze the characteristics of TE and TM waves</li> <li>• Design a RF</li> </ul>			✓	✓	✓	✓	✓									

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### Mapping of COs and Pos

		transceiver system for wireless communication																	
20152E66F	Wireless Networks	<ul style="list-style-type: none"> <li>• Carryout basic signal processing operations</li> <li>• Demonstrate their abilities towards MATLAB based implementation of various DSP systems</li> <li>• Analyze the architecture of a DSP Processor</li> <li>• Design and Implement the FIR and IIR Filters in DSP Processor for performing filtering operation over real-time signals</li> <li>• Design a DSP system for various applications of DSP</li> </ul>			✓	✓	✓	✓		✓		✓							
VII 20152C71	Antennas and Microwave Engineering	<ul style="list-style-type: none"> <li>• Simulate &amp; validate the various functional</li> </ul>			✓	✓	✓	✓											

*S. Sutha*

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### Mapping of COs and Pos

		<ul style="list-style-type: none"> <li>modules of a communication system</li> <li>• Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes</li> <li>• Apply various channel coding schemes &amp; demonstrate their capabilities towards the improvement of the noise performance of communication system</li> <li>• Simulate end-to-end communication Link</li> </ul>																
<i>Srinithya</i>	20152C72	Optical Communication	<ul style="list-style-type: none"> <li>• Communicate between two desktop computers</li> <li>• Implement the different protocols</li> <li>• Program using sockets.</li> </ul>			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

*Srinithya*

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### Mapping of COs and Pos

		<ul style="list-style-type: none"> <li>Implement and compare the various routing algorithms</li> <li>Use the simulation tool.</li> </ul>																	
20152C73	Embedded and Real Time Systems	<ul style="list-style-type: none"> <li>Understand the approaches towards and constraints in good research. Use the statistical tools used in research methodology</li> <li>Compose the manuscript for publication</li> <li>Obtain computational and excel- skills for research in engineering</li> </ul>			✓	✓	✓	✓	✓		✓								
201__OE74_	Open Elective – II																		

*S. Sathya*

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*Arumugam*

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**Mapping of COs and Pos**

20152C75	Adhoc and Wireless Sensor Networks	<ul style="list-style-type: none"> <li>• Realize the concepts of digital building blocks using MOS transistor.</li> <li>• Design combinational MOS circuits and power strategies.</li> <li>• Design and construct Sequential Circuits and Timing systems.</li> <li>• Design arithmetic building blocks and memory subsystems.</li> <li>• Apply and implement FPGA design flow and</li> </ul>			✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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### Mapping of COs and Pos

		testing.																
20152L77	Embedded Laboratory	<ul style="list-style-type: none"> <li>Characterize a wireless channel and evolve the system design specifications</li> <li>Design a cellular system based on resource availability and traffic demands</li> <li>Identify suitable signaling and multipath mitigation techniques for the wireless channel and system under consideration.</li> </ul>			✓	✓	✓	✓	✓		✓							
20152L78	Advanced Communication Laboratory	<ul style="list-style-type: none"> <li>Upon completion of the course, students will be able to have clear understanding</li> <li>Managerial functions like planning, organizing,</li> </ul>			✓	✓	✓	✓		✓								✓

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### Mapping of COs and Pos

		staffing, leading & controlling and have same basic knowledge on international aspect of management											
20152E76A	Advanced Wireless Communication	<ul style="list-style-type: none"> <li>• Explain the characteristics of transmission lines and its losses</li> <li>• Write about the standing wave ratio and input impedance in high frequency transmission lines</li> <li>• Analyze impedance matching by stubs using smith charts</li> <li>• Analyze the characteristics of TE and TM waves</li> <li>• Design a RF transceiver system for wireless</li> </ul>			✓	✓	✓	✓			✓		

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### Mapping of COs and Pos

		communication													
20152E76B	Cognitive Radio		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20152E76C	Foundation Skills in Integrated Product Development		✓	✓	✓	✓	✓		✓						✓
20152E76D	Machine Learning Techniques		✓	✓	✓	✓		✓		✓		✓			✓
20152E76E	Electronics Packaging and Testing		✓	✓	✓	✓			✓						✓
20152E76F	Mixed Signal IC Design		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20152E76G	Disaster Management														
20152E81A	Electro Magnetic Interference and Compatibility		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20152E81B	Low Power SoC Design		✓	✓	✓	✓	✓		✓						✓
20152E81C	Photonic Networks		✓	✓	✓	✓		✓		✓		✓			✓
20152E81D	Compressive Sensing		✓	✓	✓	✓			✓						✓

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### Mapping of COs and Pos

	20152E81E	Digital Image Processing		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
VIII	20152E81_	Elective – IV													
	20152P83	Project Work		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	20152PEE	Programme Exit Examination		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
	20152E82_	Elective – V													
	20152E82A	Video Analytics	<ul style="list-style-type: none"> <li>• Carryout basic signal processing operations</li> <li>• Demonstrate their abilities towards MATLAB based implementation of various DSP systems</li> <li>• Analyze the architecture of a DSP Processor</li> <li>• Design and Implement the FIR and IIR Filters in DSP Processor for</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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**Mapping of COs and Pos**

		<ul style="list-style-type: none"> <li>performing filtering operation over real-time signals</li> <li>Design a DSP system for various applications of DSP</li> </ul>											
20152E82B	DSP Architecture and Programming	<ul style="list-style-type: none"> <li>Simulate &amp; validate the various functional modules of a communication system</li> <li>Demonstrate their knowledge in base band signaling schemes through implementation of digital modulation schemes</li> <li>Apply various channel coding schemes &amp; demonstrate their capabilities towards the improvement of</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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**Mapping of COs and Pos**

		the noise performance of communication system • Simulate end-to-end communication Link											
20152E82C	Satellite Communication	• Communicate between two desktop computers • Implement the different protocols • Program using sockets. • Implement and compare the various routing algorithms • Use the simulation tool.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20152E82D	Soft Computing	• Understand the approaches towards and constraints in good research. Use the statistical tools used in	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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### Mapping of COs and Pos

		<ul style="list-style-type: none"> <li>research methodology</li> <li>• Compose the manuscript for publication</li> <li>• Obtain computational and excel- skills for research in engineering</li> </ul>												
20152E82E	Principles of Speech Processing	<ul style="list-style-type: none"> <li>• Understand and execute programs based on 8086 microprocessor.</li> <li>• Design Memory Interfacing circuits.</li> <li>• Design and interface I/O circuits.</li> <li>• Design and implement 8051 microcontroller based systems.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
20152E82F	Fundamentals of Nano Science	<ul style="list-style-type: none"> <li>• Realize the concepts of digital building</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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### Mapping of COs and Pos

			blocks using MOS transistor. <ul style="list-style-type: none"><li>• Design combinational MOS circuits and power strategies.</li><li>• Design and construct Sequential Circuits and Timing systems.</li><li>• Design arithmetic building blocks and memory subsystems.</li><li>• Apply and implement FPGA design flow and testing.</li></ul>									
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**Mapping of COs and Pos**

		<ul style="list-style-type: none"> <li>magnetic fields</li> <li>• understand the relation between the fields under time varying situations</li> <li>• understand principles of prop</li> </ul>												
19152H13P	Digital Electronics	<ul style="list-style-type: none"> <li>• introduce number systems and codes</li> <li>• introduce basic postulates of Boolean algebra and shows the correlation between Boolean expressions</li> <li>• introduce the methods for simplifying Boolean expressions</li> <li>• outline the formal procedures for the analysis and des</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓
19152H14P	Electronic Circuits - I	<ul style="list-style-type: none"> <li>• The methods of biasing transistors</li> <li>• Design of simple</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓

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		<ul style="list-style-type: none"> <li>amplifier circuits</li> <li>• Mid – band analysis of amplifier circuits using small - signal equivalent circuits to determine gain input impedance and output impedance</li> <li>• Method of calculating cutoff fre</li> </ul>												
19152H15P	Signals and Systems	<ul style="list-style-type: none"> <li>• To study the properties and representation of discrete and continuous signals.</li> <li>• To study the sampling process and analysis of discrete systems using z-transforms.</li> <li>• To study the analysis and synthesis of discrete time</li> </ul>	✓	✓	✓	✓	✓	✓				✓	✓	

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**Mapping of COs and Pos**

			systems. • To study the properties																
II	19148S21P	Numerical Methods	<ul style="list-style-type: none"> <li>• The roots of nonlinear (algebraic or transcendental) equations, solutions of large system of linear equations and eigenvalue problem of a matrix can be obtained numerically where analytical methods fail to give solution.</li> <li>• When huge amounts of experimen</li> </ul>	✓	✓	✓	✓	✓										✓	✓
	19152S22P	Electrical Engineering and Control Systems	<ul style="list-style-type: none"> <li>• To understand the operation of Electrical machines and transformers</li> <li>• To understand the open loop and closed loop</li> </ul>	✓	✓	✓	✓	✓	✓										✓

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**Mapping of COs and Pos**

		(feedback ) systems • To understand time domain and frequency domain analysis of control systems required for stability analysis. • To unde												
19152H23P	Linear Integrated Circuits	• To introduce the basic building blocks of linear integrated circuits. • To teach the linear and non- linear applications of operational amplifiers. • To introduce the theory and applications of analog multipliers and PLL. • To teach the theory of ADC and	✓	✓	✓	✓	✓	✓					✓	✓
19152H24P	Electronic Circuits - II	• The advantages and method of analysis of feed	✓	✓	✓	✓	✓	✓					✓	✓

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		<ul style="list-style-type: none"> <li>back amplifiers</li> <li>• Analysis and design of RC and LC oscillators, tuned amplifiers, wave shaping circuits, multivibrators, blocking oscillators and time based generators.</li> <li>• The advantages and method of analysis</li> </ul>																	
19152H25P	Transmission Lines and Waveguides	<ul style="list-style-type: none"> <li>• To become familiar with propagation of signals through lines</li> <li>• Understand signal propagation at Radio frequencies</li> <li>• Understand radio propagation in guided systems</li> <li>• To become familiar with resonators</li> <li>• To become</li> </ul>	✓	✓	✓	✓	✓	✓										✓	✓

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			familiar with propagation of sig																
III	19148S31BP	Probability and Random Processes	<ul style="list-style-type: none"> <li>• Have a fundamental knowledge of the basic probability concepts.</li> <li>• Have a well – founded knowledge of standard distributions which can describe real life phenomena.</li> <li>• Acquire skills in handling situations involving more than one random variable and funct</li> </ul>	✓	✓	✓	✓	✓										✓	✓
	19152H32P	Microprocessor Interfacing and Applications	<ul style="list-style-type: none"> <li>• To introduce the architecture and programming of 8085 microprocessor.</li> <li>• To introduce the interfacing of peripheral devices with 8085</li> </ul>	✓	✓	✓	✓	✓	✓									✓	✓

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**Mapping of COs and Pos**

		<ul style="list-style-type: none"> <li>microprocessor.</li> <li>• To introduce the architecture and programming of 8086</li> </ul>												
19152H33P	Digital Signal Processing	<ul style="list-style-type: none"> <li>microprocessor.</li> <li>• To introduce the applications,</li> <li>• To study DFT and its computation</li> <li>• To study the design techniques for digital filters</li> <li>• To study the finite word length effects in signal processing</li> <li>• To study the non-parametric methods of power spectrum estimations</li> <li>• To study the fundamentals of digit</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓
19152H34P	Communication Theory	<ul style="list-style-type: none"> <li>• To provide various Amplitude modulation and demodulation</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓

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**Mapping of COs and Pos**

		<p>systems.</p> <ul style="list-style-type: none"> <li>• To provide various Angle modulation and demodulation systems.</li> <li>• To provide some depth analysis in noise performance of various receiver.</li> <li>• To study some basic information theory with so</li> </ul>													
19152L35P	Digital Signal Processing and Microprocessor Lab	<ul style="list-style-type: none"> <li>• Carryout basic signal processing operations</li> <li>• Design and Implement the FIR and IIR Filters in DSP Processor for performing filtering operation over real-time signals</li> <li>• Interface different I/Os with processor</li> <li>• Generate waveforms using</li> </ul>	✓	✓	✓	✓	✓	✓					✓		✓

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### Mapping of COs and Pos

			Microprocessors																		
IV	19152H41P	Digital Communication	<ul style="list-style-type: none"> <li>To study pulse modulation and discuss the process of sampling, quantization and coding that are fundamental to the digital transmission of analog signals.</li> <li>To learn baseband pulse transmission, which deals with the transmission of pulse-amplitude, modu</li> </ul>	✓	✓	✓	✓	✓	✓											✓	✓
	19152H42P	Antenna and Wave Propagation	<ul style="list-style-type: none"> <li>To study radiation from a current element.</li> <li>To study antenna arrays</li> <li>To study aperture antennas</li> <li>To learn special antennas such as frequency</li> </ul>	✓	✓	✓	✓	✓	✓												✓

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### Mapping of COs and Pos

		<ul style="list-style-type: none"> <li>independent and broad band antennas.</li> <li>To study radio wave propagation.</li> <li>To study radiation from a current e</li> </ul>																			
19152H43P	Computer Networks	<ul style="list-style-type: none"> <li>To introduce the students the functions of different layers.</li> <li>To introduce IEEE standard employed in computer networking.</li> <li>To make students to get familiarized with different protocols and network components.</li> <li>To introduce the students the functions o</li> </ul>	✓	✓	✓	✓	✓	✓												✓	✓

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### Mapping of COs and Pos

19152E44AP	High Speed Networks	<ul style="list-style-type: none"> <li>• Students will get an introduction about ATM and Frame relay.</li> <li>• Students will be provided with an up-to-date survey of developments in High Speed Networks.</li> <li>• Enable the students to know techniques involved to support real-time traffic and congestion cont</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓
19152E44BP	Advanced Digital Signal Processing	<ul style="list-style-type: none"> <li>• To study the parametric methods for power spectrum estimation.</li> <li>• To study adaptive filtering techniques using LMS algorithm and to study the applications of adaptive filtering.</li> <li>• To study</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓

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### Mapping of COs and Pos

		<ul style="list-style-type: none"> <li>multirate signal processing fundamentals.</li> <li>To study the analysis</li> </ul>																			
19152E44CP	Speech Processing	<ul style="list-style-type: none"> <li>To introduce the models for speech production</li> <li>To develop time and frequency domain techniques for estimating speech parameters</li> <li>To introduce a predictive technique for speech compression</li> <li>To understand speech recognition, synthesis and speaker ident</li> </ul>	✓	✓	✓	✓	✓	✓												✓	
19152E44DP	Fuzzy Logic and Neural Networks	<ul style="list-style-type: none"> <li>To introduce the ideas of fuzzy sets, fuzzy logic and use of heuristics based on human experience</li> <li>To become</li> </ul>	✓	✓	✓	✓	✓	✓													✓

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**Mapping of COs and Pos**

		familiar with neural networks that can learn from available examples and generalize to form appropriate rules for inferencing systems • To prov																
19152E44FP	Digital Audio Engineering	<ul style="list-style-type: none"> <li>Analyze the type of dither.</li> <li>Analyze the recording and transmission principles in digital audio.</li> <li>Analyze the various compression techniques.</li> <li>Design and analyze the digital audio editing.</li> <li>Analyze the various application of digital audio.</li> <li>Analyze</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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**Mapping of COs and Pos**

	19152L45P	Networks and Communication Lab	<ul style="list-style-type: none"> <li>• Communicate between two desktop computers</li> <li>• Implement the different protocols</li> <li>• Implement and compare the various routing algorithms</li> <li>• Use the simulation tool</li> <li>• Simulate &amp; validate the various functional modules of a communication system</li> <li>• Apply variou</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓
V	19152H51P	Optical Communication and Networks	<ul style="list-style-type: none"> <li>• To learn the basic elements of optical fiber transmission link, fiber modes configurations and structures.</li> <li>• To understand the different kind of losses, signal distortion in</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓

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### Mapping of COs and Pos

		optical wave guides and other signal degradation factors. Design optimization o												
19152H52P	Microwave Engineering	<ul style="list-style-type: none"> <li>To study passive microwave components and their S-Parameters.</li> <li>To study Microwave semiconductor devices &amp; applications.</li> <li>To study Microwave sources and amplifiers.</li> <li>To study passive microwave components and their S-Parameters.</li> <li>T</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓
19152H53P	VLSI Design	<ul style="list-style-type: none"> <li>To learn the basic CMOS circuits.</li> <li>To learn the CMOS process</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓

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### Mapping of COs and Pos

		<ul style="list-style-type: none"> <li>technology.</li> <li>To learn techniques of chip design using programmable devices.</li> <li>To learn the concepts of designing VLSI subsystems.</li> <li>To learn the concepts of modeling a digital system using H</li> </ul>												
191_E54_P	Elective II													
19149E54AP	Environmental Science and Engineering	<ul style="list-style-type: none"> <li>Public awareness of environmental is at infant stage.</li> <li>Ignorance and incomplete knowledge has lead to misconceptions</li> <li>Development and improvement in standard of living has lead to serious</li> </ul>	✓	✓	✓	✓	✓	✓	✓			✓	✓	

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**Mapping of COs and Pos**

		environmental disasters • Public awareness of environmental is a																		
19152E54BP	Optoelectronic Devices	<ul style="list-style-type: none"> <li>• To know the basics of solid state physics and understand the nature and characteristics of light.</li> <li>• To understand different methods of luminescence, display devices and laser types and their applications.</li> <li>• To learn the principle of optical detection me</li> </ul>	✓	✓	✓	✓	✓	✓											✓	✓
19152E54DP	Digital Image Processing	<ul style="list-style-type: none"> <li>• To study the image fundamentals and mathematical transforms necessary for image processing.</li> <li>• To study the image enhancement</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓							✓

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### Mapping of COs and Pos

		<ul style="list-style-type: none"> <li>techniques</li> <li>• To study image restoration procedures.</li> <li>• To study the image compression procedures.</li> <li>• To study the image segmentati</li> </ul>											
19152E54EP	Engineering Acoustics	<ul style="list-style-type: none"> <li>• To provide mathematical basis for acoustics waves</li> <li>• To introduce the concept of radiation reception absorption and attenuation of acoustic waves.</li> <li>• To present the characteristic behaviour of sound in pipes, resonators and filters.</li> <li>• To introduce the pro</li> </ul>	✓	✓	✓	✓	✓	✓				✓	✓

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Dept: ECE- BTech (FT)

### Mapping of COs and Pos

19152E54FP	Software Engineering	<ul style="list-style-type: none"> <li>• Identify the key activities in managing a software project.</li> <li>• Compare different process models.</li> <li>• Concepts of requirements engineering and Analysis Modeling.</li> <li>• Apply systematic procedure for software design and deployment.</li> <li>• Compare and contrast the</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓
19152L55P	Optical Communication and Microwave Lab	<ul style="list-style-type: none"> <li>• Analyze the performance of simple optical link.</li> <li>• Test microwave and optical components.</li> <li>• Analyse the mode characteristics of fiber</li> <li>• Analyse the</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓

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**Mapping of COs and Pos**

			radiation of pattern of antenna. • Analyze the performance of simple optical link. • Test microwave and op																		
VI	19152H61P	Mobile and Wireless Communication	• It deals with the fundamental cellular radio concepts such as frequency reuse and handoff. This also demonstrates the principle of trunking efficiency and how trunking and interference issues between mobile and base stations combine to affect the overall	✓	✓	✓	✓	✓	✓											✓	✓
	19152H62P	Medical Electronics	• To study the methods of recording various biopotentials • To study how to measure biochemical and	✓	✓	✓	✓	✓													✓

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### Mapping of COs and Pos

		<ul style="list-style-type: none"> <li>various physiological information</li> <li>• To understand the working of units which will help to restore normal functioning</li> <li>• To understand the use of radiation f</li> </ul>																		
19152H63P	Micro Controller and Embedded systems	<ul style="list-style-type: none"> <li>• To study 8051 architecture</li> <li>• To write assembly language programming</li> <li>• To study the embedded architecture and real time applications.</li> <li>• To study 8051 architecture</li> <li>• To write assembly language programming</li> <li>• To study the embedded architecture and</li> </ul>	✓	✓	✓	✓	✓	✓											✓	✓

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**Mapping of COs and Pos**

		real time																
191_E64_P	Elective III																	
19160E64AP	Principles Of Management	<ul style="list-style-type: none"> <li>• Upon completion of the course, students will be able to have clear understanding</li> <li>• Managerial functions like planning, organizing, staffing, leading &amp; controlling and have same basic knowledge on international aspect of management</li> <li>• Upon completion of t</li> </ul>									✓	✓	✓			✓	✓	✓
19152E64BP	Satellite Communication	<ul style="list-style-type: none"> <li>• Overview of satellite systems in relation to other terrestrial systems.</li> <li>• Study of satellite orbits and</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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### Mapping of COs and Pos

		<ul style="list-style-type: none"> <li>launching.</li> <li>• Study of earth segment and space segment components</li> <li>• Study of satellite access by various users.</li> <li>• Study of DTH and compression standar</li> </ul>																	
19152E64CP	Robotics	<ul style="list-style-type: none"> <li>• The course has been so designed to give the students an overall view of the mechanical components and mathematics associated with the same.</li> <li>• Actuators and sensors necessary for the functioning of the robot.</li> <li>• The course has been so designed to give the</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

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**Mapping of COs and Pos**

19152E64DP	Remote sensing	<ul style="list-style-type: none"> <li>Principles of Remote Sensing and GIS</li> <li>Analysis of RS and GIS data and interpreting the data for modeling applications</li> <li>Principles of Remote Sensing and GIS</li> <li>Analysis of RS and GIS data and interpreting the data for modeling applications</li> </ul>	✓	✓	✓	✓	✓	✓										✓	✓	
19150E64FP	Transducer Engineering	<ul style="list-style-type: none"> <li>to model and analyze transducers</li> </ul>	✓	✓	✓	✓	✓	✓											✓	✓
19152L65P	VLSI and Embedded systems Lab	<ul style="list-style-type: none"> <li>Write HDL code for basic as well as advanced digital integrated circuit</li> <li>Import the logic modules into FPGA Boards</li> <li>Synthesize Place and Route the digital IPs</li> <li>Write programs</li> </ul>	✓	✓	✓	✓	✓	✓											✓	✓

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### Mapping of COs and Pos

			in ARM for a specific Application																
VII	19160S71P	Total Quality Management	<ul style="list-style-type: none"> <li>Interface memory, A/D and D/A convertor</li> <li>The student would be able to apply the tools and techniques of quality management to manufacturing and services processes.</li> </ul>							✓	✓	✓		✓	✓	✓			
	19152H72P	Wireless Networks	<ul style="list-style-type: none"> <li>To understand physical as wireless MAC layer alternatives techniques.</li> <li>To learn planning and operation of wireless networks.</li> <li>To study various wireless LAN and WAN concepts.</li> <li>To understand WPAN and geo-location systems.</li> </ul>	✓	✓	✓	✓	✓										✓	✓

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### Mapping of COs and Pos

19152H73P	Telecommunication Switching and Networks	<ul style="list-style-type: none"> <li>To introduce the concepts of Frequency and Time division multiplexing.</li> <li>To introduce digital multiplexing and digital hierarchy namely SONET / SDH</li> <li>To introduce the concepts of space switching, time switching and combination switching, example of a sw</li> </ul>	✓	✓	✓	✓	✓											✓	✓	
191_E74_P	<b>Elective IV</b>																			
19152E74AP	Power Electronics	<ul style="list-style-type: none"> <li>To study about power electronic circuits for voltage and current control and protection.</li> <li>To learn the switching characteristics of transistors and</li> </ul>	✓	✓	✓	✓	✓	✓											✓	✓

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### Mapping of COs and Pos

		SCRs. Series and parallel functions of SCRs, Programmable triggering methods of SCR. • To learn controll																		
19152E74BP	Advanced Microprocessors	• To introduce the concepts in internal programming model of Intel family of microprocessors. • To introduce the programming techniques using MASM, DOS and BIOS function calls. • To introduce the basic architecture of Pentium family of processors. • To in	✓	✓	✓	✓	✓	✓											✓	✓
19152E74CP	Electromagnetic Interference and Compatibility	• To understand EMI Sources, EMI problems and their solution methods in PCB level /	✓	✓	✓	✓	✓	✓											✓	✓

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**Mapping of COs and Pos**

		Subsystem and system level design. • To measure the emission immunity level from different systems to couple with the prescribed EMC standards																	
19152E74DP	Solid State Electronic Drives	• To learn crystal structures of elements used for fabrication of semiconductor devices. • To study energy band structure of semiconductor devices. • To understand fermi levels, movement of charge carriers, Diffusion current and Drift current. • To study	✓	✓	✓	✓	✓	✓										✓	✓

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**Mapping of COs and Pos**

19152E74FP	Space Time Wireless Communication	<ul style="list-style-type: none"> <li>• Design and analyze the channel characterization.</li> <li>• Analyze the capacity of random MIMO channel.</li> <li>• Design and analyze the order diversity and channel variability.</li> <li>• Analyze the multiple antenna coding and receivers.</li> <li>• Analyze the MIMO multi user detectio</li> </ul>	✓	✓	✓	✓	✓	✓					✓	✓
19152P75P	Project Work & Viva Voce	<ul style="list-style-type: none"> <li>• apply fundamental and disciplinary concepts and methods in ways appropriate to their principal area of study.</li> </ul>	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓

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## Mapping of COs and Pos

			demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study. •																
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		<p>various coupling losses.</p> <ul style="list-style-type: none"> <li>• Classify the Optical sources and detectors and to discuss their principle.</li> <li>• Familiar with Design considerations of fiber optic systems.</li> <li>• To perform characteristics of optical fiber, sources and detectors, design as well as conduct experiments in software and hardware, analyze the results to provide valid conclusions.</li> </ul>											
19271E16D	MEMS and NEMS	<p>Ability to understand the operation of micro devices, micro systems and their applications</p> <p>Ability to design the micro devices, micro systems using the</p>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	







		communication. • Outline cellular mobile communication standards. Analyze various methodologies to improve the cellular capacity													
19271H22	Advanced Microwave Systems	• Capability to design Microwave circuits. • To be able to analyze microwave integrated circuits.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			
19271H23	Fiber Optic Networking	• Design and Analyze Network Components • Assess and Evaluate optical networks	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓
<b>ELECTIVE II</b>															
19271E24A	High Speed Switching Architecture	• The student would be able to identify suitable switch architectures for a specified networking scenario and	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓



		<p>appropriate statistical speech model for a given application.</p> <ul style="list-style-type: none"> <li>• Design a speech recognition system.</li> <li>• Use different text analysis and speech synthesis techniques.</li> </ul>											
19271E24D	ASIC and FPGA Design	<ul style="list-style-type: none"> <li>• Demonstrate VLSI tool-flow and appreciate FPGA architecture.</li> <li>• Understand the issues involved in ASIC design, including technology choice, design management, tool-flow, verification, debug and test, as well as the impact of technology scaling on ASIC design.</li> <li>• Understand the</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓		

		<p>algorithms used for ASIC construction</p> <ul style="list-style-type: none"> <li>• Understand the basics of System on Chip, On chip communication architectures like AMBA, AXI and utilizing Platform based design.</li> <li>• Appreciate high performance algorithms available for ASICs</li> </ul>											
19271E25A	Digital Communication Receivers	<ul style="list-style-type: none"> <li>• Apply basic principles of digital communication techniques.</li> <li>• Discuss on receivers for AWGN &amp; Fading channel</li> <li>• Describe various synchronization techniques.</li> <li>• Design adaptive equalization</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓		

		algorithms to satisfy the evolving demands in digital communication.																		
19271E25B	Soft Computing	<ul style="list-style-type: none"> <li>• Knowledge on concepts of soft computational techniques.</li> <li>• Able to apply soft computational techniques to solve various problems.</li> <li>• Motivate to solve research oriented problems.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								
19271E25C	Communication Network Security	<ul style="list-style-type: none"> <li>• Explain digital signature standards</li> <li>• Discuss authentication</li> <li>• Explain security at different layers</li> </ul>	✓	✓	✓	✓	✓		✓	✓	✓	✓								
19271L26	Communication Systems Lab - II	<ul style="list-style-type: none"> <li>• Apply knowledge to identify a suitable architecture and systematically design an RF system.</li> <li>•</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓								

		<p>Comprehensively record and report the measured data, and would be capable of analyzing, interpreting the experimentally measured data and produce the meaningful conclusions.</p> <ul style="list-style-type: none"> <li>• Design and develop microstrip filters.</li> </ul>											
192TECWR	Technical Writing /Seminars	<p>Selecting a subject, narrowing the subject into a topic</p> <p>2. Stating an objective.</p> <p>3. Collecting the relevant bibliography (atleast 15 journal papers)</p> <p>4. Preparing a working outline.</p> <p>5. Studying the papers and understanding the authors contributions and critically analysing each</p>							✓	✓	✓	✓	

		<p>paper.</p> <p>6. Preparing a working outline</p> <p>7. Linking the papers and preparing a draft of the paper.</p> <p>8. Preparing conclusions based on the reading of all the papers.</p> <p>9. Writing the Final Paper and giving final Presentation</p>												
19271CRM	Research Methodology	<p>a. Understanding research questions and tools</p> <p>b. Experience in scientific writings</p> <p>c. Practice in various aspects of scientific publications</p> <p>d. Inculcation of research ethics</p>							✓	✓	✓	✓		
19271CBR	Participation in Bounded Research	<p>a. Hands on exposure to problem solving tools in contemporary research</p> <p>b. Evolution of research intuitiveness and orientation.</p>							✓	✓	✓	✓		

			Familiarity with cutting edge research trends												
III	19271H31	Wireless Sensor Networks	<ul style="list-style-type: none"> <li>• Familiar with the latest 4G networks and LTE</li> <li>• Understand about the wireless IP architecture and LTE network architecture.</li> <li>• Familiar with the adaptive link layer and network layer graphs and protocol.</li> <li>• Understand about the mobility management and cellular network.</li> <li>• Understand about the wireless sensor network architecture and its concept.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
ELECTIVE IV															













		bandwidth communications over a large portion of the radio spectrum												
19271P35	Project Phase – I	<p>The student should be able to:</p> <ul style="list-style-type: none"> <li>• Apply fundamental and disciplinary concepts and methods in ways appropriate to their principal area of study.</li> <li>• Demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.</li> <li>• Use effectively oral, written and visual communication.</li> <li>• Identify, analyze, and solve problems creatively through sustained critical investigation.</li> </ul>												✓











	19271C12 P	Statistical Signal Processing	<ul style="list-style-type: none"> <li>• Formulate time domain and frequency domain description of Wide Sense Stationary process in terms of matrix algebra and relate to linear algebra concepts.</li> <li>• State Parseval's theorem, W-K theorem, principle of orthogonality, spectral factorization theorem, Widrow-Hoff LMS algorithm and Shannon's sampling theorem, and define linear prediction, linear estimation, sample auto-correlation, periodogram, bias and consistency.</li> <li>• Explain various noise types, Yule-Walker algorithm, parametric and non-parametric methods, Wiener and Kalman filtering, LMS and RMS algorithms, Levinson Durbin algorithm, adaptive noise cancellation and adaptive echo cancellation, speed verses convergence issues, channel equalization, sampling rate change, subband</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
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		generation of OFDM signals and the techniques of multiuser detection.												
19271L14 P	Communication Systems Lab - I	<ul style="list-style-type: none"> <li>• Measure and analyze various transmission line parameters.</li> <li>• Design Microstrip patch antennas.</li> <li>• Implement the adaptive filtering algorithms</li> <li>• To generate and detect digital communication signals of various modulation techniques using MATLAB.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
19271CRS P	Research Led Seminar	<ul style="list-style-type: none"> <li>a. Exposure to various research domains</li> <li>b. Acquaintance with languages of research</li> <li>c. Development of research aptitude</li> </ul>									✓		✓	
<b>SEM-II</b>														

19271C21 P	Mobile Communication Networks	<ul style="list-style-type: none"> <li>• Discuss cellular radio concepts.</li> <li>• Identify various propagation effects.</li> <li>• To have knowledge of the mobile system specifications.</li> <li>• Classify multiple access techniques in mobile communication.</li> <li>• Outline cellular mobile communication standards.</li> </ul> <p>Analyze various methodologies to improve the cellular capacity</p>	✓	✓	✓	✓	✓	✓	✓	✓	✓	
19271C22 P	Advanced Microwave Systems	<ul style="list-style-type: none"> <li>• Capability to design Microwave circuits.</li> <li>• To be able to analyze microwave integrated circuits.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	
19271L24 P	Communication Systems Lab - II	<ul style="list-style-type: none"> <li>• Apply knowledge to identify a suitable architecture and systematically design an RF system.</li> <li>• Comprehensively record and report the measured data, and would be capable of analyzing, interpreting the experimentally measured data and produce the meaningful conclusions.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	

		<ul style="list-style-type: none"> <li>• Design and develop microstrip filters.</li> </ul>											
19271TEC WRP	Technical Writing /Seminars	<p>Selecting a subject, narrowing the subject into a topic</p> <p>2. Stating an objective.</p> <p>3. Collecting the relevant bibliography (atleast 15 journal papers)</p> <p>4. Preparing a working outline.</p> <p>5. Studying the papers and understanding the authors contributions and critically analysing each paper.</p> <p>6. Preparing a working outline</p> <p>7. Linking the papers and preparing a draft of the paper.</p> <p>8. Preparing conclusions based on the reading of all the papers.</p>											✓

		9. Writing the Final Paper and giving final Presentation												
19271CR MP	Research Methodology	a. Understanding research questions and tools b. Experience in scientific writings c. Practice in various aspects of scientific publications d. Inculcation of research ethics							✓					
19271CB RP	Participation in Bounded Research	a. Hands on exposure to problem solving tools in contemporary research b. Evolution of research intuitiveness and orientation c. Familiarity							✓					





19271CSR P	Design/Socio technical Project	Sensitization of social needs for innovation b. Team work towards interdisciplinary synchronous research strategy c. Development of critical thinking and synergistic research approach.											
<b>SEM-IV</b>													
19271C41 P	Wireless Sensor Networks	<ul style="list-style-type: none"> <li>• Familiar with the latest 4G networks and LTE</li> <li>• Understand about the wireless IP architecture and LTE network architecture.</li> <li>• Familiar with the adaptive link layer and network layer graphs and protocol.</li> <li>• Understand about the mobility management and cellular network.</li> <li>• Understand about the wireless sensor network architecture and its concept.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
19271C42 P	Fiber Optic Networking	<ul style="list-style-type: none"> <li>• Design and Analyze Network Components</li> <li>• Assess and Evaluate optical networks</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

19271P44 P	Project Phase – I	<p>The student should be able to:</p> <ul style="list-style-type: none"> <li>• Apply fundamental and disciplinary concepts and methods in ways appropriate to their principal area of study.</li> <li>• Demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.</li> <li>• Use effectively oral, written and visual communication.</li> <li>• Identify, analyze, and solve problems creatively through sustained critical investigation.</li> <li>• Integrate information from multiple sources.</li> <li>• Demonstrate an awareness and application of appropriate personal, societal, and professional ethical standards.</li> <li>• Practice the skills, diligence, and commitment to excellence needed to engage in lifelong learning.</li> </ul>												
<b>ELECTIVE-I</b>														

19271E2 3AP	High Speed Switching Architecture	<ul style="list-style-type: none"> <li>• The student would be able to identify suitable switch architectures for a specified networking scenario and demonstrate its blocking performance.</li> <li>• The student would be in a position to apply his knowledge of switching technologies, architectures and buffering strategies for designing high speed communication networks and analyse their performance</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
19271E2 3BP	DSP Processor Architecture and Programming	<ul style="list-style-type: none"> <li>• Become Digital Signal Processor specialized engineer</li> <li>• DSP based System Developer</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

	19271E2 3CP	Digital Speech Processing	<ul style="list-style-type: none"> <li>• Model speech production system and describe the fundamentals of speech.</li> <li>• Extract and compare different speech parameters.</li> <li>• Choose an appropriate statistical speech model for a given application.</li> <li>• Design a speech recognition system.</li> <li>• Use different text analysis and speech synthesis techniques.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
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	19271E2 3DP	ASIC and FPGA Design	<ul style="list-style-type: none"> <li>• Demonstrate VLSI tool-flow and appreciate FPGA architecture.</li> <li>• Understand the issues involved in ASIC design, including technology choice, design management, tool-flow, verification, debug and test, as well as the impact of technology scaling on ASIC design.</li> <li>• Understand the algorithms used for ASIC construction</li> <li>• Understand the basics of System on Chip, On chip communication architectures like AMBA, AXI and utilizing Platform based design.</li> <li>• Appreciate high performance algorithms available for ASICs</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	
<b>ELECTIVE-II</b>													

	19271E3 3AP	Internetwo rking and Multimedi a	<ul style="list-style-type: none"> <li>• Understand the state-of-art developments in Internet technologies and applications</li> <li>• Understand the development of next generation Internet</li> <li>• Appreciate the principles used in designing Internet protocols for multimedia applications, and so understand why standard protocols are designed the way that they are</li> <li>• Be able to solve problems for the design of multimedia applications on Internet.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
	19271E3 3BP	Digital Image Processing	<ul style="list-style-type: none"> <li>• Explain the fundamentals digital image processing.</li> <li>• Describe image various segmentation and feature extraction techniques for image analysis.</li> <li>• Discuss the concepts of image registration and fusion.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	

	19271E3 3CP	LASER Communication	<p>Recognize and classify the structures of Optical fiber and types.</p> <ul style="list-style-type: none"> <li>• Discuss the channel impairments like losses and dispersion.</li> <li>• Analyze various coupling losses.</li> <li>• Classify the Optical sources and detectors and to discuss their principle.</li> <li>• Familiar with Design considerations of fiber optic systems.</li> <li>• To perform characteristics of optical fiber, sources and detectors, design as well as conduct experiments in software and hardware, analyze the results to provide valid conclusions.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	
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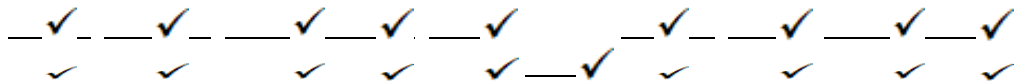
	19271E3 3DP	MEMS and NEMS	Ability to understand the operation of micro devices, micro systems and their applications Ability to design the micro devices, micro systems using the MEMS fabrication process. Gain a knowledge of basic approaches for various sensor design Gain a knowledge of basic approaches for various actuator design Develop experience on micro/nano systems for photonics . Gain the technical knowledge required for computer-aided design, fabrication, analysis and characterization of nano-structured materials, micro- and nano-scale devices.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
<b>EELECTIVEIII</b>														



19271E4  
3DP

Radar  
Signal  
Processing

- Know how a radar is built and understand the principles of behavior.
- Have a basic understanding of how radar signals propagate through a medium, and the mechanisms for signal reflection from the target and unwanted reflections (“clutter”).
- Understand the basic principles of signal processing done in a radar.
- Be able to estimate the performance of a radar based on parameters provided, for example at what distance the radar will be able to detect targets of a given size.
- Be able to assess what type of radar is suitable for which task (choice of waveforms, frequency bands, etc..).
- Be able to use numerical tools to calculate radar performance and to











19271E5 3CP	Mobile ADHOC networks	<ul style="list-style-type: none"> <li>• Identify different issues in wireless ad hoc and sensor networks.</li> <li>• To analyze protocols developed for ad hoc and sensor networks.</li> <li>• To identify and address the security threats in ad hoc and sensor networks.</li> <li>• Establish a Sensor network environment for different type of applications.</li> </ul>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		
19271E5 3DP	Ultra Wide Band Communi cation	radio technology that can use a very low energy level for short-range, high-bandwidth communications over a large portion of the radio spectrum	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	
<b>SEM VI</b>														



	19271P61 P	Project Phase – II	<p>The student should be able to:</p> <ul style="list-style-type: none"> <li>• Apply fundamental and disciplinary concepts and methods in ways appropriate to their principal area of study.</li> <li>• Demonstrate skill and knowledge of current information and technological tools and techniques specific to the professional field of study.</li> <li>• Use effectively oral, written and visual communication.</li> <li>• Identify, analyze, and solve problems creatively through sustained critical investigation.</li> <li>• Integrate information from multiple sources.</li> <li>• Demonstrate an awareness and application of appropriate personal, societal, and professional ethical standards.</li> <li>• Practice the skills, diligence, and commitment to excellence needed to engage in lifelong</li> </ul>												
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