

Course No.	Course Name	L-T-P - Credits	Year of Introduction
MA201	LINEAR ALGEBRA AND COMPLEX ANALYSIS	3-1-0-4	2016
<b>Prerequisite : Nil</b>			
<b>Course Objectives</b> <b>COURSE OBJECTIVES</b> <ul style="list-style-type: none"> <li>To equip the students with methods of solving a general system of linear equations.</li> <li>To familiarize them with the concept of Eigen values and diagonalization of a matrix which have many applications in Engineering.</li> <li>To understand the basic theory of functions of a complex variable and conformal Transformations.</li> </ul>			
<b>Syllabus</b> Analyticity of complex functions-Complex differentiation-Conformal mappings-Complex integration-System of linear equations-Eigen value problem			
<b>Expected outcome .</b> At the end of the course students will be able to (i) solve any given system of linear equations (ii) find the Eigen values of a matrix and how to diagonalize a matrix (iii) identify analytic functions and Harmonic functions. (iv) evaluate real definite Integrals as application of Residue Theorem (v) identify conformal mappings (vi) find regions that are mapped under certain Transformations			
<b>Text Book:</b> Erwin Kreyszig: Advanced Engineering Mathematics, 10 <sup>th</sup> ed. Wiley			
<b>References:</b> 1. Dennis g Zill & Patric D Shanahan-A first Course in Complex Analysis with Applications-Jones & Bartlet Publishers 2. B. S. Grewal. Higher Engineering Mathematics, Khanna Publishers, New Delhi. 3. Lipschutz, Linear Algebra, 3e ( Schaums <b>Series</b> ) McGraw Hill Education India 2005 4. Complex variables introduction and applications-second edition-Mark.J.Owitz-Cambridge Publication			
<b>Course Plan</b>			
Module	Contents	Hours	Sem. Exam Marks
<b>I</b>	Complex differentiation Text 1[13.3,13.4] Limit, continuity and derivative of complex functions	3	15%
	Analytic Functions	2	
	Cauchy–Riemann Equation (Proof of sufficient condition of analyticity & C R Equations in polar form not required)-Laplace's Equation	2	
	Harmonic functions, Harmonic Conjugate	2	
<b>II</b>	Conformal mapping: Text 1[17.1-17.4] Geometry of Analytic functions Conformal Mapping,	1	15%
	Mapping $w = z^2$ conformality of $w = e^z$ .	2	

	<p>The mapping <math>w = z + \frac{1}{z}</math></p> <p>Properties of <math>w = \frac{1}{z}</math></p> <p>Circles and straight lines, extended complex plane, fixed points</p> <p>Special linear fractional Transformations, Cross Ratio, Cross Ratio property-Mapping of disks and half planes</p> <p>Conformal mapping by <math>w = \sin z</math> &amp; <math>w = \cos z</math></p> <p>(Assignment: Application of analytic functions in Engineering)</p>	<p>1</p> <p>3</p> <p>3</p>	
<b>FIRST INTERNAL EXAMINATION</b>			
<b>III</b>	<p><u>Complex Integration. Text 1[14.1-14.4] [15.4&amp;16.1]</u></p> <p>Definition Complex Line Integrals, First Evaluation Method, Second Evaluation Method</p> <p>Cauchy's Integral Theorem(without proof), Independence of path(without proof), Cauchy's Integral Theorem for Multiply Connected Domains (without proof)</p> <p>Cauchy's Integral Formula- Derivatives of Analytic Functions(without proof)Application of derivative of Analytical Functions</p> <p>Taylor and Maclaurin series(without proof), Power series as Taylor series, Practical methods(without proof)</p> <p>Laurent's series (without proof)</p>	<p>2</p> <p>2</p> <p>2</p> <p>2</p> <p>2</p>	15%
<b>IV</b>	<p><u>Residue Integration Text 1 [16.2-16.4]</u></p> <p>Singularities, Zeros, Poles, Essential singularity, Zeros of analytic functions</p> <p>Residue Integration Method, Formulas for Residues, Several singularities inside the contour Residue Theorem.</p> <p>Evaluation of Real Integrals (i) Integrals of rational functions of <math>\sin\theta</math> and <math>\cos\theta</math> (ii)Integrals of the type <math>\int_{-\infty}^{\infty} f(x)dx</math> (Type I, Integrals from 0 to <math>\infty</math> )</p> <p>( Assignment : Application of Complex integration in Engineering)</p>	<p>2</p> <p>4</p> <p>3</p>	15%
<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	<p>Linear system of Equations Text 1(7.3-7.5)</p> <p>Linear systems of Equations, Coefficient Matrix, Augmented Matrix</p> <p>Gauss Elimination and back substitution, Elementary row operations, Row equivalent systems, Gauss elimination-Three possible cases, Row Echelon form and Information from it.</p>	<p>1</p> <p>5</p>	20%

	Linear independence-rank of a matrix Vector Space-Dimension-basis-vector space $\mathbf{R}^3$	2	
	Solution of linear systems, Fundamental theorem of non-homogeneous linear systems(Without proof)-Homogeneous linear systems (Theory only)	1	
<b>VI</b>	Matrix Eigen value Problem Text 1.(8.1,8.3 &8.4) Determination of Eigen values and Eigen vectors-Eigen space Symmetric, Skew Symmetric and Orthogonal matrices –simple properties (without proof) Basis of Eigen vectors- Similar matrices Diagonalization of a matrix- Quadratic forms- Principal axis theorem(without proof) (Assignment-Some applications of Eigen values(8.2))	3 2 4	20%
<b>END SEMESTER EXAM</b>			

**QUESTION PAPER PATTERN:**

Maximum Marks : 100                      Exam Duration: 3 hours

The question paper will consist of 3 parts.

Part A will have 3 questions of 15 marks each uniformly covering modules I and II. Each question may have two sub questions.

Part B will have 3 questions of 15 marks each uniformly covering modules III and IV. Each question may have two sub questions.

Part C will have 3 questions of 20 marks each uniformly covering modules V and VI. Each question may have three sub questions.

Any two questions from each part have to be answered.

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC201	NETWORK THEORY	3-1-0-4	2016
<b>Prerequisite: Nil</b>			
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>To make the students capable of analyzing any linear time invariant electrical network.</li> <li>To study time domain, phasor and Laplace transform methods of linear circuit analysis.</li> <li>To study the transient response of networks subject to test signals.</li> <li>To develop understanding of the concept of resonance, coupled circuits and two port networks.</li> </ul>			
<b>Syllabus:</b>			
Circuit variables and Circuit elements, Kirchhoff's laws, Network topology, Mesh and node analysis of network, Laplace transform, Inverse Laplace transform, Solution of differential equations by using Laplace transforms, Transient analysis of RL, RC, and RLC networks, Network functions for the single port and two ports, Parameters of two-port network, Resonance, Coupled circuits			
<b>Expected outcome:</b>			
At the end of the course students will be able to analyze the linear time invariant electrical circuits.			
<b>Text Books</b>			
<ol style="list-style-type: none"> <li>Ravish R., Network Analysis and Synthesis, 2/e, McGraw-Hill, 2015.</li> <li>Valkenburg V., Network Analysis, 3/e, PHI, 2011.</li> </ol>			
<b>References:</b>			
<ol style="list-style-type: none"> <li>Sudhakar A,S. P. Shyammohan, Circuits and Networks- Analysis and Synthesis, 5/e, McGraw-Hill, 2015.</li> <li>Choudhary R., Networks and Systems, 2/e, New Age International, 2013.</li> <li>Franklin F. Kuo, Network Analysis and Synthesis, 2/e, Wiley India, 2012.</li> <li>Pandey S. K., Fundamentals of Network Analysis and Synthesis, 1/e, S. Chand, 2012.</li> <li>Edminister, Electric Circuits – Schaum's Outline Series, McGraw-Hill,2009.</li> </ol>			
<b>Course Plan</b>			
Module	Course content (48 hrs)	Hours	Sem. Exam Marks (%)
I	Introduction to circuit variables and circuit elements ,Review of Kirchhoff's Laws, Independent and dependent Sources, Source transformations	3	15
	Network topology, Network graphs, Trees, Incidence matrix, Tie-set matrix and Cut-set matrix	2	
	Solution methods applied to dc and phasor circuits: Mesh and node analysis of network containing independent and dependent sources	3	
II	Network theorems applied to dc and phasor circuits: Thevenin's theorem, Norton's theorem, Superposition theorem, Reciprocity theorem, Millman's theorem, Maximum power transfer theorem	6	15

	Laplace transform, properties Laplace Transforms and inverse Laplace transform of common functions, Important theorems: Time shifting theorem, Frequency shifting theorem, Time differentiation theorem, Time integration theorem, s domain differentiation theorem, s domain integration theorem, Initial value theorem, Final value theorem	4	
<b>FIRST INTERNAL EXAM</b>			
<b>III</b>	Partial Fraction expansions for inverse Laplace transforms, Solution of differential equations using Laplace transforms	3	<b>15</b>
	Transformation of basic signals and circuits into s-domain	2	
	Transient analysis of RL, RC, and RLC networks with impulse, step, pulse, exponential and sinusoidal inputs	3	
	Analysis of networks with transformed impedance and dependent sources.	3	
<b>IV</b>	Network functions for the single port and two ports, properties of driving point and transfer functions, Poles and Zeros of network functions, Significance of Poles and Zeros	3	<b>15</b>
	Time domain response from pole zero plot, Impulse Response	1	
	Network functions in the sinusoidal steady state, Magnitude and Phase response	3	
<b>SECOND INTERNAL EXAM</b>			
<b>V</b>	Parameters of two port network: impedance, admittance, transmission and hybrid parameters, Interrelationship among parameter sets	5	<b>20</b>
	Series and parallel connections of two port networks	2	
	Reciprocal and Symmetrical two port network	2	
	Characteristic impedance, Image impedance and propagation constant (derivation not required)	2	
<b>VI</b>	Resonance: Series resonance, bandwidth, Q factor and Selectivity, Parallel resonance	3	<b>20</b>
	Coupled circuits: single tuned and double tuned circuits, dot convention, coefficient of coupling, Analysis of coupled circuits	4	
<b>END SEMESTER EXAM</b>			

### Question Paper Pattern (End Sem Exam)

**Maximum Marks: 100**

**Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark pattern is according to the syllabus with maximum 30% for theory and 70% for logical/numerical problems, derivation and proof.

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC203	SOLID STATE DEVICES	3-1-0-4	2016
<b>Prerequisite:</b> Nil			
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>To provide an insight into the basic semiconductor concepts</li> <li>To provide a sound understanding of current semiconductor devices and technology to appreciate its applications to electronics circuits and systems</li> </ul>			
<b>Syllabus:</b> Elemental and compound semiconductors, Fermi-Dirac distribution, Equilibrium and steady state conditions: Equilibrium concentration of electrons and holes, Temperature dependence of carrier concentration, Carrier transport in semiconductors, High field effects, Hall effect, Excess carriers in semiconductors, PN junctions, contact potential, electrical field, potential and charge density at the junction, energy band diagram, minority carrier distribution, ideal diode equation, electron and hole component of current in forward biased pn junction, piecewise linear model of a diode, effect of temperature on VI characteristics, Diode capacitances, electrical breakdown in pn junctions, Tunnel Diode, Metal semiconductor contacts, bipolar junction transistor, metal insulator semiconductor devices, MOSFET, FinFET			
<b>Expected outcome:</b>			
The students should have a good knowledge in semiconductor theory and electronic devices.			
<b>Text Books:</b>			
<ol style="list-style-type: none"> <li>Ben G. Streetman and Sanjay Kumar Banerjee, Solid State Electronic Devices, Pearson, 6/e, 2010</li> <li>Achuthan, K N Bhat, Fundamentals of Semiconductor Devices, 1e, McGraw Hill, 2015</li> </ol>			
<b>References:</b>			
<ol style="list-style-type: none"> <li>Tyagi M.S., Introduction to Semiconductor Materials and Devices, Wiley India, 5/e, 2008</li> <li>Sze S.M., Physics of Semiconductor Devices, John Wiley, 3/e, 2005</li> <li>Neamen, Semiconductor Physics and Devices, McGraw Hill, 4/e, 2012</li> <li>Pierret, Semiconductor Devices Fundamentals, Pearson, 2006</li> <li>Rita John, Solid State Devices, McGraw-Hill, 2014</li> <li>Bhattacharya .Sharma, Solid State Electronic Devices, Oxford University Press, 2012</li> <li>Dasgupta and Dasgupta, Semiconductor Devices : Modelling and Technology (PHI)</li> </ol>			
<b>Course Plan</b>			
Module	Course content (48hrs)	Hours	Sem. Exam Marks
<b>I</b>	Elemental and compound semiconductors, Fermi-Dirac distribution, Equilibrium and steady state conditions, Equilibrium concentration of electrons and holes, Temperature dependence of carrier concentration	4	<b>15</b>
	Carrier transport in semiconductors, drift, conductivity and mobility, variation of mobility with temperature and doping, High Field Effects, Hall effect	5	
<b>II</b>	Excess carriers in semiconductors: Generation and recombination mechanisms of excess carriers, quasi Fermi levels, diffusion, Einstein relations, Continuity equations, Diffusion length, Gradient of quasi Fermi level	9	<b>15</b>
<b>FIRST INTERNAL EXAM</b>			

<b>III</b>	PN junctions : Contact potential, Electrical Field, Potential and Charge density at the junction, Energy band diagram, Minority carrier distribution, Ideal diode equation, Electron and hole component of current in forward biased p-n junction, piecewise linear model of a diode effect of temperature on V-I characteristics	9	<b>15</b>
<b>IV</b>	Diode capacitances, switching transients, Electrical Breakdown in PN junctions, Zener and avalanche break down (abrupt PN junctions only), Tunnel Diode basics only, Metal Semiconductor contacts, Ohmic and Rectifying Contacts, current voltage characteristics	9	<b>15</b>
<b>SECOND INTERNAL EXAM</b>			
<b>V</b>	Bipolar junction transistor , current components, Minority carrier distributions, basic parameters, Evaluation of terminal currents (based on physical dimensions), Transistor action, Base width modulation	9	<b>20</b>
<b>VI</b>	Metal Insulator semiconductor devices: The ideal MOS capacitor, band diagrams at equilibrium, accumulation, depletion and inversion, surface potential, CV characteristics, effects of real surfaces, work function difference, interface charge, threshold voltage MOSFET: Output characteristics, transfer characteristics, sub threshold characteristics, MOSFET scaling (basic concepts)	9	<b>20</b>
	FinFET- structure and operation	1	
<b>END SEMESTER EXAM</b>			

### Question Paper Pattern (End Sem Exam)

**Maximum Marks: 100**

**Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark pattern is according to the syllabus with maximum 70 % for theory, derivation, proof and 30% for logical/numerical problems.

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC205	ELECTRONIC CIRCUITS	3-1-0-4	2016
<b>Prerequisite:</b> Nil			
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>To develop the skill of analysis and design of various analog circuits using discrete electronic devices as per the specifications.</li> </ul>			
<b>Syllabus:</b>			
High pass and low pass RC circuits, Differentiator, Integrator, Analysis of BJT biasing circuits, small signal analysis of transistor configurations using small signal hybrid $\pi$ model, low frequency and high frequency analysis of BJT amplifiers, Cascade amplifiers, Wide band amplifiers, Feedback amplifiers, Oscillators, Tuned amplifiers, Power amplifiers, Sweep circuits and multivibrators, transistor voltage regulator, DC analysis of MOSFET circuits, small signal equivalent circuit, Small signal analysis of MOSFET amplifier circuits, Analysis of multistage MOSFET amplifiers			
<b>Expected outcome:</b>			
<ul style="list-style-type: none"> <li>At the end of the course, students will be able to analyse and design the different electronic circuits using discrete electronic components.</li> </ul>			
<b>Text Books:</b>			
<ul style="list-style-type: none"> <li>Sedra A. S. and K. C. Smith, Microelectronic Circuits, 6/e, Oxford University Press, 2013</li> <li>Millman J. and C. Halkias, Integrated Electronics, 2/e, McGraw-Hill, 2010</li> </ul>			
<b>References:</b>			
<ol style="list-style-type: none"> <li>Neamen D., Electronic Circuits - Analysis and Design, 3/e, TMH, 2007</li> <li>Rashid M. H., Microelectronic Circuits - Analysis and Design, Cengage Learning, 2/e, 2011</li> <li>Spencer R. R. and M. S. Ghauri, Introduction to Electronic Circuit Design, Pearson, 2003</li> <li>Razavi B., Fundamentals of Microelectronics, Wiley, 2015</li> </ol>			
<b>Course Plan</b>			
Module	Course content (48 hrs)	Hours	Sem. Exam Marks
<b>I</b>	RC Circuits: Response of high pass and low pass RC circuits to sine, step, pulse and square wave inputs, Differentiator, Integrator	5	<b>15</b>
	BJT biasing circuits: Types, Q point, Bias stability, Stability factors, RC coupled amplifier and effect of various components, Concept of DC and AC load lines, Fixing of operating point, Classification of amplifiers	5	
<b>II</b>	Small signal analysis of CE, CB and CC configurations using small signal hybrid $\pi$ model (gain, input and output impedance). Small signal analysis of BJT amplifier circuits, Cascade amplifier	7	<b>15</b>
<b>FIRST INTERNAL EXAM</b>			
<b>III</b>	High frequency equivalent circuits of BJT, Short circuit current gain, cutoff frequency, Miller effect, Analysis of high frequency response of CE, CB and CC amplifiers	4	<b>15</b>
	Wide band amplifier: Broad banding techniques, low frequency and high frequency compensation, Cascode amplifier.	4	
<b>IV</b>	Feedback amplifiers: Effect of positive and negative feedback on gain, frequency response and distortion, Feedback topologies and	3	<b>15</b>



	its effect on input and output impedance, Feedback amplifier circuits in each feedback topologies (no analysis required)		
	Oscillators & Tuned Amplifiers: Classification of oscillators, Barkhausen criterion, Analysis of RC phase shift and Wien bridge oscillators, Working of Hartley, Colpitts and Crystal oscillators; Tuned amplifiers, synchronous and stagger tuning	6	
<b>SECOND INTERNAL EXAM</b>			
<b>V</b>	Power amplifiers: Classification, Transformer coupled class A power amplifier, push pull class B and class AB power amplifiers, efficiency and distortion, Transformer-less class B and Class AB power amplifiers, Class C power amplifier (no analysis required)	6	<b>20</b>
	Switching Circuits: Simple sweep circuit, Bootstrap sweep circuit, Astable, Bistable, and Monostable multivibrators, Schmitt Trigger	5	
<b>VI</b>	Transistor based voltage regulator: Design and analysis of shunt and series voltage regulator, load and line regulation, Short circuit protection	4	<b>20</b>
	MOSFET amplifiers: Biasing of MOSFET amplifier, DC analysis of single stage MOSFET amplifier, small signal equivalent circuit. Small signal voltage and current gain, input and output impedances of CS configuration, MOSFET Cascade amplifier	5	
<b>END SEMESTER EXAM</b>			

### Question Paper Pattern (End Sem Exam)

**Maximum Marks: 100**

**Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark pattern is according to the syllabus with maximum 60 % for theory, derivation, proof and 40% for logical/numerical problems.

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC207	LOGIC CIRCUIT DESIGN	3-0-0-3	2016
<b>Prerequisite:</b> Nil			
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>To work with a positional number systems and numeric representations</li> <li>To introduce basic postulates of Boolean algebra and show the correlation between Boolean expression</li> <li>To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits</li> <li>To study the fundamentals of HDL</li> <li>To design and implement combinational circuits using basic programmable blocks</li> <li>To design and implement synchronous sequential circuits</li> </ul>			
<b>Syllabus:</b>			
Positional Number Systems, Boolean algebra, Combinational Logic, HDL concepts ,Digital ICs, Programmable Logic Devices, Sequential Logic, Sequential Circuits			
<b>Expected outcome:</b>			
The student should able to:			
1. Compare various positional number systems and binary codes			
2. Apply Boolean algebra in logic circuit design			
3. Design combinational and sequential circuits			
4. Design and implement digital systems using basic programmable blocks			
5. Formulate various digital systems using HDL			
<b>Text Books:</b>			
1. Donald D Givone, Digital Principles and Design, Tata McGraw Hill, 2003 2. John F Wakerly, Digital Design Principles and Practices, Pearson Prentice Hall, 2007			
<b>References:</b>			
1. Ronald J Tocci, Digital Systems, Pearson Education, 11 <sup>th</sup> edition, 2010 2. Thomas L Floyd, Digital Fundamentals, Pearson Education, 8 <sup>th</sup> edition 2009 3. Moris Mano, Digital Design, Prentice Hall of India, 3 <sup>rd</sup> edition, 2002 4. John M Yarbrough, Digital Logic Applications and Design, Cenage learning, 2009 5. David Money Harris, Sarah L Harris, Digital Design and Computer Architecture, Morgan Kaufmann – Elsevier, 2009			
<b>Course Plan</b>			
Module	Course content (42 hrs)	Hours	Sem. Exam Marks
<b>I</b>	Number systems- decimal, binary, octal, hexa decimal, base conversion	2	<b>15</b>
	1's and 2's complement, signed number representation Binary arithmetic, binary subtraction using 2's complement	2	
	Binary codes (grey, BCD and Excess-3), Error detection and correcting codes : Parity(odd, even), Hamming code (7,4), Alphanumeric codes : ASCII	2	
<b>II</b>	Logic expressions, Boolean laws, Duality, De Morgan's law, Logic functions and gates	2	<b>15</b>
	Canonical forms: SOP, POS, Realisation of logic expressions using K-	2	

	map (2,3,4 variables)		
	Design of combinational circuits – adder, subtractor, 4 bit adder/subtractor, BCD adder, MUX, DEMUX, Decoder, BCD to 7 segment decoder, Encoder, Priority encoder, Comparator (2/3 bits)	4	
<b>FIRST INTERNAL EXAM</b>			
<b>III</b>	Introduction to HDL : Logic descriptions using HDL, basics of modeling (only for assignments)	2	<b>0</b>
	Logic families and its characteristics: Logic levels, propagation delay, fan in, fan out, noise immunity , power dissipation, TTL subfamilies	1	<b>15</b>
	NAND in TTL (totem pole, open collector and tri-state), CMOS:NAND, NOR, and NOT in CMOS, Comparison of logic families (TTL,ECL,CMOS) in terms of fan-in, fan-out, supply voltage, propagation delay, logic voltage and current levels, power dissipation and noise margin	2	
	Programmable Logic devices - ROM, PLA, PAL, implementation of simple circuits using PLA	2	
<b>IV</b>	Sequential circuits - latch, flip flop ( SR, JK, T, D), master slave JK FF, conversion of FFs, excitation table and characteristic equations	3	<b>15</b>
	Asynchronous and synchronous counter design, mod N counters, random sequence generator	5	
<b>SECOND INTERNAL EXAM</b>			
<b>V</b>	Shift Registers - SIPO, SISO, PISO, PIPO, Shift registers with parallel LOAD/SHIFT	3	<b>20</b>
	Shift register counter - Ring Counter and Johnson Counter		
	Mealy and Moore models, state machine ,notations, state diagram, state table, transition table, excitation table, state equations	3	
<b>VI</b>	Construction of state diagram – up down counter, sequence detector	3	<b>20</b>
	Synchronous sequential circuit design - State equivalence	2	
	State reduction – equivalence classes, implication chart	2	
<b>END SEMESTER EXAM</b>			

**Assignments:**

1. Simple combinational circuit design using MUX, DEMUX, PLA & PAL
2. HDL simulation of circuits like simple ALU, up-down counter, linear feedback shift register, sequence generator

**Question Paper Pattern (End Sem Exam)****Maximum Marks: 100****Time : 3 hours**

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Course code	Course Name	L-T-P-Credits	Year of Introduction
HS210	LIFE SKILLS	2-0-2	2016
<b>Prerequisite : Nil</b>			
<p><b>Course Objectives</b></p> <ul style="list-style-type: none"> <li>• To develop communication competence in prospective engineers.</li> <li>• To enable them to convey thoughts and ideas with clarity and focus.</li> <li>• To develop report writing skills.</li> <li>• To equip them to face interview &amp; Group Discussion.</li> <li>• To inculcate critical thinking process.</li> <li>• To prepare them on problem solving skills.</li> <li>• To provide symbolic, verbal, and graphical interpretations of statements in a problem description.</li> <li>• To understand team dynamics &amp; effectiveness.</li> <li>• To create an awareness on Engineering Ethics and Human Values.</li> <li>• To instill Moral and Social Values, Loyalty and also to learn to appreciate the rights of others.</li> <li>• To learn leadership qualities and practice them.</li> </ul>			
<p><b>Syllabus</b></p> <p><b>Communication Skill:</b> Introduction to Communication, The Process of Communication, Barriers to Communication, Listening Skills, Writing Skills, Technical Writing, Letter Writing, Job Application, Report Writing, Non-verbal Communication and Body Language, Interview Skills, Group Discussion, Presentation Skills, Technology-based Communication.</p> <p><b>Critical Thinking &amp; Problem Solving:</b> Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats, Mind Mapping &amp; Analytical Thinking.</p> <p><b>Teamwork:</b> Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance &amp; Team Conflicts.</p> <p><b>Ethics, Moral &amp; Professional Values:</b> Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE.</p> <p><b>Leadership Skills:</b> Leadership, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid &amp; leadership Formulation.</p>			
<p><b>Expected outcome</b></p> <p>The students will be able to</p> <ul style="list-style-type: none"> <li>• Communicate effectively.</li> <li>• Make effective presentations.</li> <li>• Write different types of reports.</li> <li>• Face interview &amp; group discussion.</li> <li>• Critically think on a particular problem.</li> <li>• Solve problems.</li> <li>• Work in Group &amp; Teams</li> <li>• Handle Engineering Ethics and Human Values.</li> <li>• Become an effective leader.</li> </ul>			

**Resource Book:**

*Life Skills for Engineers*, Compiled by ICT Academy of Kerala, McGraw Hill Education (India) Private Ltd., 2016

**References:**

- Barun K. Mitra; (2011), “*Personality Development & Soft Skills*”, First Edition; Oxford Publishers.
- Kalyana; (2015) “*Soft Skill for Managers*”; First Edition; Wiley Publishing Ltd.
- Larry James (2016); “*The First Book of Life Skills*”; First Edition; Embassy Books.
- Shalini Verma (2014); “*Development of Life Skills and Professional Practice*”; First Edition; Sultan Chand (G/L) & Company
- John C. Maxwell (2014); “*The 5 Levels of Leadership*”, Centre Street, A division of Hachette Book Group Inc.

**Course Plan**

Module	Contents	Hours L-T-P		Sem. Exam Marks
		L	P	
I	Need for Effective Communication, Levels of communication; Flow of communication; Use of language in communication; Communication networks; Significance of technical communication, Types of barriers; Miscommunication; Noise; Overcoming measures,	2		See evaluation scheme
	Listening as an active skill; Types of Listeners; Listening for general content; Listening to fill up information; Intensive Listening; Listening for specific information; Developing effective listening skills; Barriers to effective listening skills.		2	
	<b>Technical Writing:</b> Differences between technical and literary style, Elements of style; Common Errors, <b>Letter Writing:</b> Formal, informal and demi-official letters; business letters, <b>Job Application:</b> Cover letter, Differences between bio-data, CV and Resume, <b>Report Writing:</b> Basics of Report Writing; Structure of a report; Types of reports.		4	
	<b>Non-verbal Communication and Body Language:</b> Forms of non-verbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of body language	3		
	<b>Interview Skills:</b> Types of Interviews; Ensuring success in job interviews; Appropriate use of non-verbal communication, <b>Group Discussion:</b> Differences between group discussion and debate; Ensuring success in group discussions, <b>Presentation Skills:</b> Oral presentation and public speaking skills; business presentations, <b>Technology-based Communication:</b> Netiquettes: effective e-mail messages; power-point presentation; enhancing editing skills using computer software.		4	

<p><b>II</b></p>	<p>Need for Creativity in the 21<sup>st</sup> century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity</p> <p>Critical thinking Vs Creative thinking, Functions of Left Brain &amp; Right brain, Convergent &amp; Divergent Thinking, Critical reading &amp; Multiple Intelligence.</p> <p>Steps in problem solving, Problem Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections.</p> <p>Problem Solving strategies, Analytical Thinking and quantitative reasoning expressed in written form, Numeric, symbolic, and graphic reasoning, Solving application problems.</p>	<p>2</p> <p>2</p> <p>2</p>	<p>2</p> <p>2</p>	
<p><b>III</b></p>	<p>Introduction to Groups and Teams, Team Composition, Managing Team Performance, Importance of Group, Stages of Group, Group Cycle, Group thinking, getting acquainted, Clarifying expectations.</p> <p>Group Problem Solving, Achieving Group Consensus.</p> <p>Group Dynamics techniques, Group vs Team, Team Dynamics, Teams for enhancing productivity, Building &amp; Managing Successful Virtual Teams. Managing Team Performance &amp; Managing Conflict in Teams.</p> <p>Working Together in Teams, Team Decision-Making, Team Culture &amp; Power, Team Leader Development.</p>	<p>3</p> <p>3</p> <p>3</p>	<p>2</p> <p>2</p>	
<p><b>IV</b></p>	<p>Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully.</p> <p>Caring, Sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character</p> <p>Spirituality, Senses of 'Engineering Ethics', variety of moral issues, Types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, Consensus and controversy, Models of Professional Roles, Theories about right action, Self-interest, customs and religion, application of ethical theories.</p> <p>Engineering as experimentation, engineers as responsible experimenters, Codes of ethics, Balanced outlook on.</p> <p>The challenger case study, Multinational corporations, Environmental ethics, computer ethics,</p>	<p>3</p> <p>3</p> <p>3</p>	<p>2</p> <p>2</p>	

	Weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE), India, etc.	3		
V	Introduction, a framework for considering leadership, entrepreneurial and moral leadership, vision, people selection and development, cultural dimensions of leadership, style, followers, crises.	4	2	
	Growing as a leader, turnaround leadership, gaining control, trust, managing diverse stakeholders, crisis management			
	Implications of national culture and multicultural leadership Types of Leadership, Leadership Traits.	2		
	Leadership Styles, VUCA Leadership, DART Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders, making of a Leader, Formulate Leadership		2	
<b>END SEMESTER EXAM</b>				

### EVALUATION SCHEME

#### Internal Evaluation

*(Conducted by the College)*

**Total Marks: 100**

#### Part – A

*(To be started after completion of Module 1 and to be completed by 30<sup>th</sup> working day of the semester)*

1. Group Discussion – Create groups of about 10 students each and engage them on a GD on a suitable topic for about 20 minutes. Parameters to be used for evaluation is as follows;

- |       |                        |   |          |
|-------|------------------------|---|----------|
| (i)   | Communication Skills   | – | 10 marks |
| (ii)  | Subject Clarity        | – | 10 marks |
| (iii) | Group Dynamics         | - | 10 marks |
| (iv)  | Behaviors & Mannerisms | - | 10 marks |

*(Marks: 40)*

**Part – B**

*(To be started from 31<sup>st</sup> working day and to be completed before 60<sup>th</sup> working day of the semester)*

2. Presentation Skills – Identify a suitable topic and ask the students to prepare a presentation (preferably a power point presentation) for about 10 minutes. Parameters to be used for evaluation is as follows;

(i)	Communication Skills*	-	10 marks
(ii)	Platform Skills**	-	10 marks
(iii)	Subject Clarity/Knowledge	-	10 marks

*(Marks: 30)*

\* Language fluency, audibility, voice modulation, rate of speech, listening, summarizes key learnings etc.

\*\* Postures/Gestures, Smiles/Expressions, Movements, usage of floor area etc.

**Part – C**

*(To be conducted before the termination of semester)*

3. Sample Letter writing or report writing following the guidelines and procedures. Parameters to be used for evaluation is as follows;

(i)	Usage of English & Grammar	-	10 marks
(ii)	Following the format	-	10 marks
(iii)	Content clarity	-	10 marks

*(Marks: 30)*

**External Evaluation**  
*(Conducted by the University)*

Total Marks: 50

Time: 2 hrs.

**Part – A****Short Answer questions**

There will be one question from each area (five questions in total). Each question should be written in about maximum of 400 words. Parameters to be used for evaluation are as follows;

- (i) Content Clarity/Subject Knowledge
- (ii) Presentation style
- (iii) Organization of content



(Marks: 5 x 6 = 30)

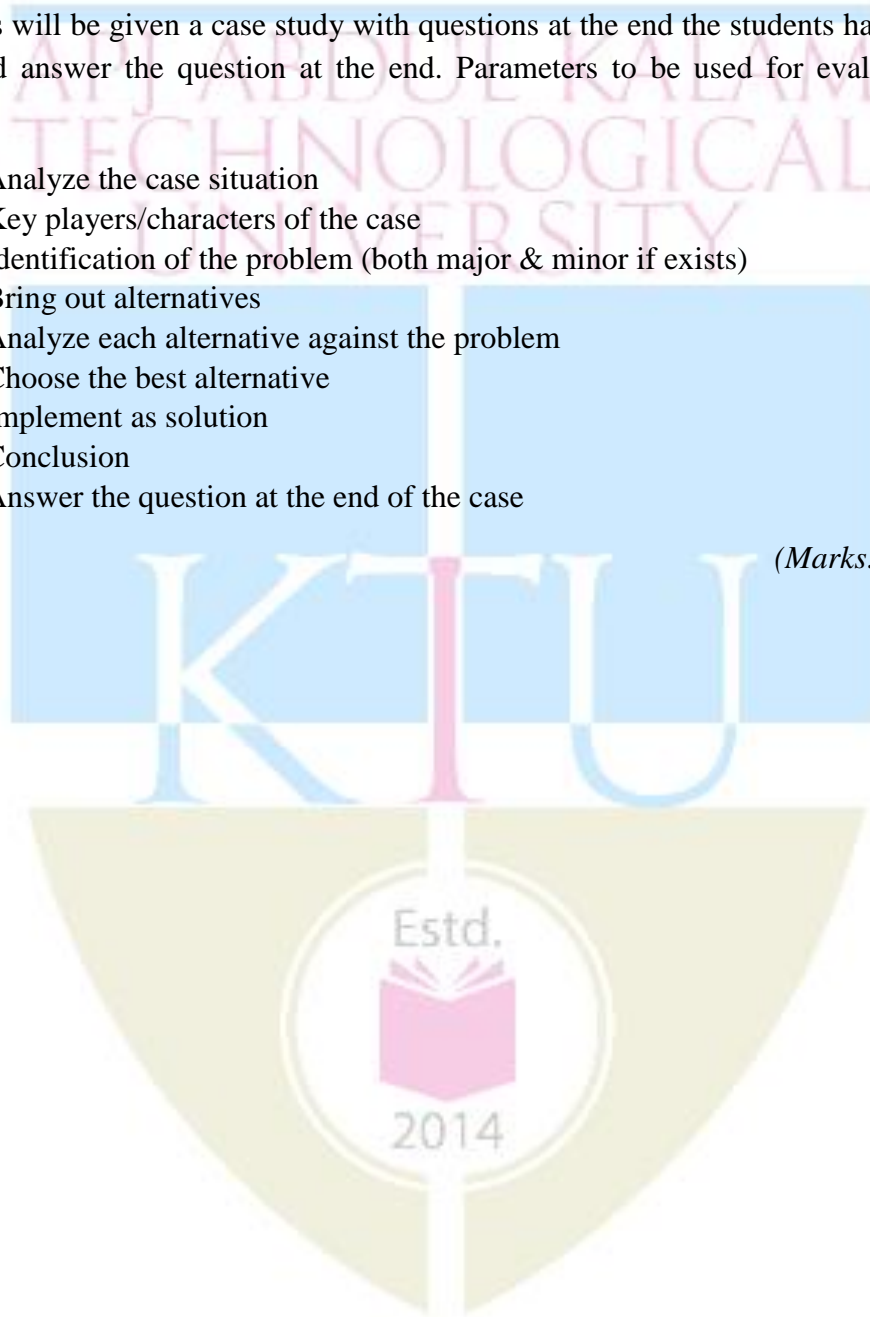
## Part – B

### Case Study

The students will be given a case study with questions at the end the students have to analyze the case and answer the question at the end. Parameters to be used for evaluation are as follows;

- (i) Analyze the case situation
- (ii) Key players/characters of the case
- (iii) Identification of the problem (both major & minor if exists)
- (iv) Bring out alternatives
- (v) Analyze each alternative against the problem
- (vi) Choose the best alternative
- (vii) Implement as solution
- (viii) Conclusion
- (ix) Answer the question at the end of the case

(Marks: 1 x 20 = 20)



Course code	Course Name	L-T-P - Credits	Year of Introduction
HS200	Business Economics	3-0-0-3	2016
<b>Prerequisite: Nil</b>			
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>To familiarize the prospective engineers with elementary Principles of Economics and Business Economics.</li> <li>To acquaint the students with tools and techniques that are useful in their profession in Business Decision Making which will enhance their employability;</li> <li>To apply business analysis to the “firm” under different market conditions;</li> <li>To apply economic models to examine current economic scenario and evaluate policy options for addressing economic issues</li> <li>To gain understanding of some Macroeconomic concepts to improve their ability to understand the business climate;</li> <li>To prepare and analyse various business tools like balance sheet, cost benefit analysis and rate of returns at an elementary level</li> </ul>			
<b>Syllabus</b> Business Economics - basic concepts, tools and analysis, scarcity and choices , resource allocation, marginal analysis, opportunity costs and production possibility curve. Fundamentals of microeconomics - Demand and Supply Analysis, equilibrium, elasticity, production and production function, cost analysis, break-even analysis and markets. Basics of macroeconomics - the circular flow models, national income analysis, inflation, trade cycles, money and credit, and monetary policy. Business decisions - investment analysis, Capital Budgeting decisions, forecasting techniques and elementary Balance Sheet and taxation, business financing, international investments			
<b>Expected outcome .</b> A student who has undergone this course would be able to <ol style="list-style-type: none"> <li>make investment decisions based on capital budgeting methods in alignment with microeconomic and macroeconomic theories.</li> <li>able to analyse the profitability of the firm, economy of operation, determination of price under various market situations with good grasp on the effect of trade cycles in business.</li> <li>gain knowledge on Monetary theory, measures by RBI in controlling interest rate and emerging concepts like Bit Coin.</li> <li>gain knowledge of elementary accounting concepts used for preparing balance sheet and interpretation of balance sheet</li> </ol>			
<b>Text Books</b> <ol style="list-style-type: none"> <li>Geetika, Piyali Ghosh and Chodhury, <i>Managerial Economics</i>, Tata McGraw Hill, 2015</li> <li>Gregory Mankiw, <i>Principles of Macroeconomics</i>, Cengage Learning, 2006.</li> <li>M.Kasi Reddy and S.Saraswathi, <i>Economics and Financial Accounting</i>. Prentice Hall of India. New Delhi.</li> </ol>			

**References:**

1. Dornbusch, Fischer and Startz, *Macroeconomics*, McGraw Hill, 11th edition, 2010.
2. Khan M Y, *Indian Financial System*, Tata McGraw Hill, 7th edition, 2011.
3. Samuelson, *Managerial Economics*, 6<sup>th</sup> edition, Wiley
4. Snyder C and Nicholson W, *Fundamentals of Microeconomics*, Cengage Learning (India), 2010.
5. Truett, *Managerial Economics: Analysis, Problems, Cases*, 8<sup>th</sup> Edition, Wiley
6. Welch, *Economics: Theory and Practice* 7<sup>th</sup> Edition, Wiley
7. Uma Kapila, *Indian Economy Since Independence, 26th Edition: A Comprehensive and Critical Analysis of India's Economy, 1947-2015*
8. C Rangarajan, *Indian Economy, Essays on monetary and finance*, UBS Publishers'Distributors, 1998
9. A.Ramachandra Aryasri, *Managerial Economics and Financial Analysis*, Tata McGraw-Hill, New Delhi.
10. Dominick Salvatore, *Managerial Economics in Global Economy*, Thomas Western College Publishing, Singapore.
11. I.M .Pandey, *Financial Management*, Vikas Publishing House. New Delhi.
12. Dominick Salvatore, *Theory and Problems of Micro Economic Theory*. Tata Mac Graw-Hill, New Delhi.
13. T.N.Hajela. *Money, Banking and Public Finance*. Anne Books. New Delhi.
14. G.S.Gupta. *Macro Economics-Theory and Applications*. Tata Mac Graw- Hill, New Delhi.
15. Yogesh, Maheswari, *Management Economics* , PHI learning, NewDelhi, 2012
16. Timothy Taylor , *Principles of Economics*, 3<sup>rd</sup>edition, TEXTBOOK MEDIA.
17. Varshney and Maheshwari. *Managerial Economics*. Sultan Chand. New Delhi

**Course Plan**

Module	Contents	Hours	Sem. Exam Marks
I	<b>Business Economics</b> and its role in managerial decision making-meaning-scope-relevance-economic problems-scarcity Vs choice (2 Hrs)-Basic concepts in economics-scarcity, choice, resource allocation- Trade-off-opportunity cost-marginal analysis- marginal utility theory, Law of diminishing marginal utility -production possibility curve (2 Hrs)	4	15%
II	<b>Basics of Micro Economics I</b> Demand and Supply analysis-equilibrium-elasticity (demand and supply) (3 Hrs.) -Production concepts-average product-marginal product-law of variable proportions- Production function-Cobb Douglas function-problems (3 Hrs.)	6	15%
<b>FIRST INTERNAL EXAMINATION</b>			
III	<b>Basics of Micro Economics II</b> Concept of costs-marginal, average, fixed, variable costs-cost curves-shut down point-long run and short run (3 Hrs.)- Break Even Analysis-Problem-Markets-Perfect Competition, Monopoly and Monopolistic Competition, Oligopoly-Cartel and collusion (3 Hrs.).	6	15%
IV	<b>Basics of Macro Economics</b> - Circular flow of income-two sector and multi-sector models- National Income Concepts-Measurement methods-problems-Inflation, deflation (4 Hrs.)-Trade cycles-Money-stock and flow concept-Quantity theory of money-Fischer's Equation and Cambridge Equation -velocity of circulation of money-credit control methods-SLR, CRR, Open Market Operations-Repo and Reverse Repo rate-emerging concepts in money-bit coin (4 Hrs.).	8	15%

<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	<b>Business Decisions I</b> -Investment analysis-Capital Budgeting-NPV, IRR, Profitability Index, ARR, Payback Period (5 Hrs.)- Business decisions under certainty-uncertainty-selection of alternatives-risk and sensitivity- cost benefit analysis-resource management (4 Hrs.).	9	20%
<b>VI</b>	<b>Business Decisions II</b> Balance sheet preparation-principles and interpretation-forecasting techniques (7 Hrs.)-business financing-sources of capital- Capital and money markets-international financing-FDI, FPI, FII-Basic Principles of taxation-direct tax, indirect tax-GST (2 hrs.).	9	20%
<b>END SEMESTER EXAM</b>			

### Question Paper Pattern

Max. marks: 100, Time: 3 hours

The question paper shall consist of three parts

**Part A**

4 questions uniformly covering modules I and II. Each question carries 10 marks  
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part B**

4 questions uniformly covering modules III and IV. Each question carries 10 marks  
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

**Part C**

6 questions uniformly covering modules V and VI. Each question carries 10 marks  
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

**Note:** In all parts, each question can have a maximum of four sub questions, if needed.

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC231	Electronic Devices & Circuits Lab	0-0-3-1	2016
<b>Prerequisite:</b> Should have registered for EC205 Electronic circuits			
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>• To study the working of analog electronic circuits.</li> <li>• To design and implement analog circuits as per the specifications using discrete electronic components.</li> </ul>			
<b>List of Experiments: (12 Mandatory Experiments)</b>			
<ol style="list-style-type: none"> <li>1. VI Characteristics of rectifier and zener diodes</li> <li>2. RC integrating and differentiating circuits (Transient analysis with different inputs and frequency response)</li> <li>3. Clipping and clamping circuits (Transients and transfer characteristics)</li> <li>4. Fullwave Rectifier -with and without filter- ripple factor and regulation</li> <li>5. Simple Zener voltage regulator (load and line regulation)</li> <li>6. Characteristics of BJT in CE configuration and evaluation of parameters</li> <li>7. Characteristics of MOSFET in CS configuration and evaluation of parameters</li> <li>8. RC coupled CE amplifier - frequency response characteristics</li> <li>9. MOSFET amplifier (CS) - frequency response characteristics</li> <li>10. Cascade amplifier – gain and frequency response</li> <li>11. Cascode amplifier -frequency response</li> <li>12. Feedback amplifiers (current series, voltage series) - gain and frequency response</li> <li>13. Low frequency oscillators –RC phaseshift, Wien bridge,</li> <li>14. High frequency oscillators –Colpitt's and Hartley</li> <li>15. Power amplifiers (transformer less) - Class B and Class AB</li> <li>16. Transistor series voltage regulator (load and line regulation)</li> <li>17. Tuned amplifier - frequency response</li> <li>18. Bootstrap sweep circuit</li> <li>19. Multivibrators -Astable, Monostable and Bistable</li> <li>20. Schmitt trigger</li> </ol>			
<b>Expected outcome:</b>			
The student should able to:			
<ol style="list-style-type: none"> <li>1. Design and demonstrate functioning of various discrete analog circuits.</li> <li>2. Function effectively as an individual and in a team to accomplish the given task.</li> </ol>			

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC233	ELECTRONICS DESIGN AUTOMATION LAB	0-0-3-1	2016

**Prerequisite:** Nil

**Course Objectives :**

The primary objective of this course is to familiarize the students, how to simulate the electronics/digital circuits, signals and systems using the soft-wares which are available for the modern design methodologies for the rapid design and verification of complex electronic systems.

**List of Exercises / Experiments**

**1 Introduction to SPICE**

[Institution can use any one circuit simulation package with schematic entry like EDWinXP, PSpice, Multisim, Proteus or CircuitLab.]

Introduction to SPICE software. Recognize various schematic symbols /model parameters of resistor, capacitor, inductor, energy sources (VCVS, C CVS, Sinusoidal source, pulse, etc), transformer, DIODE, BJT, FET, MOSFET, etc., units & values. Use SPICE Schematic Editor to draw and analyse (DC, AC, Transient) simple analog and digital electronic circuits.

**List of Experiments using SPICE [Six experiments mandatory]**

Simulation of following circuits using SPICE [Schematic entry of circuits using standard package, Analysis –Transient, AC, DC]

1. Potential divider network
2. RC integrating and differentiating circuits
3. Diode, BJT and MOSFET characteristics
4. Diode Circuits (Clipping, Clamping, Rectifiers)
5. RC coupled amplifier (Single & two stages)
6. RC oscillator (RC phase shift / Wien Bridge)
7. Astable multivibrator
8. Truth table verification of basic and universal gates
9. Half adder /full adder circuits using gates
10. 4 bit adder/BCD adder
11. Encoder/Multiplexers
12. Flipflops/Counters

**2 Introduction to MATLAB**

[Institution can use any one numerical computational package like SciLab, Octave, Spyder, Python (scipy) or Freemat instead of MATLAB]

**Fundamentals**, basic operations on array, matrix, complex numbers etc., Script and function files, plotting commands, control statements.

Writing simple programs for handling arrays and plotting of mathematical functions, plotting of analog, discrete and noise signals, analysing the simple electronic circuits/network using node and mesh equations.

**List of Experiments [Four experiments mandatory]**

Write program and obtain the solutions

1. Solve /plot the mathematical equations containing complex numbers, array, matrix multiplication and quadratic equations etc

	<ol style="list-style-type: none"> <li>2. Obtain different types of plots (2D/3D, surface plot, polar plot)</li> <li>3. Generate and plot various signals like sine square, pulse in same window.</li> <li>4. Plot the diode/transistor characteristics.</li> <li>5. Solve node, mesh and loop equations of simple electrical/network circuits.</li> <li>6. Find the poles and zeros hence plot the transfer functions/polynomials</li> <li>7. Sort numbers in ascending order and save to another text file using text read and sort function after reading n floating point numbers from a formatted text file stored in the system.</li> <li>8. Plot a full wave rectified waveform using Fourier series</li> </ol>
3	<p><b><u>Introduction to HDL</u></b></p> <p>[Institution can choose VHDL or Verilog as language to describe the problem and any one simulation/synthesis tool like Xilinx ISE, Modelsim, QSim, verilog, VHDL, EDwinXP or ORCAD etc. for the simulation.]</p> <p><b>List of Experiments using HDL</b></p> <p>Write the HDL code to realise and simulate the following circuits: (at least 4 of the following)</p> <ol style="list-style-type: none"> <li>1. Basic gates/universal gates</li> <li>2. Combinational Circuits (Half adder/Half subtractor)</li> <li>3. Full adder in 3 modelling styles (Dataflow/structural/Behavioural)</li> <li>4. Multiplexer/De-multiplexer</li> <li>5. Decoder/Encoder</li> <li>6. 4 bit adder/BCD adder</li> <li>7. Flipflops (SR,JK,T,D)</li> <li>8. Binary Counters</li> <li>9. Finite state machines</li> </ol>
	<p><b><u>Expected outcomes:</u></b></p> <ol style="list-style-type: none"> <li>1. An ability to apply knowledge of computer, science, and engineering to the analysis of electrical and electronic engineering problems.</li> <li>2. An ability to design systems which include hardware and software components.</li> <li>3. An ability to identify, formulate and solve engineering problems.</li> <li>4. An ability to use modern engineering techniques</li> </ol>

Course code	Course Name	L-T-P -Credits	Year of Introduction
MA204	Probability, Random Processes and Numerical Methods	3-1-0-4	2016
<b>Prerequisite: Nil</b>			
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>To introduces the modern theory of probability and its applications to modelling and analysis and processing of random processes and signals.</li> <li>To learn most of the important models of discrete and continuous probability distributions and widely used models of random processes such as Poisson processes and Markov chains.</li> <li>To understand some basic numerical methods for interpolation and integration and also for finding roots of equations and solutions of ODEs.</li> </ul>			
<b>Syllabus</b> Discrete random variables- Continuous Random variables-Multiple Random variables. Random Processes- Autocorrelation, Power spectrum-Special Random Processes. Numerical Methods.			
<b>Expected outcome.</b> At the end of the course students would have become familiar with quantifying and analysing random phenomena using various models of probability distributions and random processes. They would also have learned the concepts of autocorrelation and power spectral density. Some of the fundamental numerical methods learned in the course would help them to solve a variety of mathematical problems by the use of computers when analytical methods fail or are difficult.			
<b>Text Book:</b> <ol style="list-style-type: none"> <li>V.Sundarapandian, "Probability, Statistics and Queueing theory", PHI Learning, 2009</li> <li>Erwin Kreyszig, "Advanced Engineering Mathematics", 10<sup>th</sup> edition, Wiley, 2015.</li> </ol>			
<b>References:</b> <ol style="list-style-type: none"> <li>HosseinPishro-Nik, "Introduction to Probability, Statistics and Random Processes", Kappa Research, 2014 ( Also available online at <a href="http://www.probabilitycourse.com">www.probabilitycourse.com</a> )</li> <li>OliverC.Ibe,FundamentalsOfAppliedProbabilityandRandomProcesses"Elsevier,2005.</li> <li>T Veerarajan "Probability Statistics and Random Process" Third edition-McGraw Hill.</li> <li>Ward-Cheney , Numerical Mathematical and computing,Cengage Learning-7<sup>th</sup> Edition</li> </ol>			
<b>Course Plan</b>			
Module	Contents	Hours	End Sem. Exam Marks
<b>I</b>	<b>Discrete random variables [Text 1: Relevant portions of sections 2.1, 2.2,2.3, 2.5, 3.3 and 3.4]</b>		
	Discrete random variables, probability mass function, cumulative distribution function, expected value, mean and variance.	3	
	Binomial random variable-, mean, variance.	2	
	Poisson random variable, mean, variance, approximation of binomial by Poisson.	2	
	Distribution fitting-binomial and Poisson.	2	15%
<b>II</b>	<b>Continuous random variables [Text 1: Relevant portions of sections 2.4, 2.5, 3.7, 3.8 and 3.11]</b>		
	Continuous random variables, Probability density function, expected value, mean and variance.	2	
	Uniform random variable-, mean, variance.	2	15%



	Exponential random variable-mean, variance, memoryless property. Normal random variable-Properties of Normal curve mean, variance (without proof), Use of Normal tables.	2 3		
<b>FIRST INTERNAL EXAMINATION</b>				
<b>III</b>	<b>Joint distributions [Text 1: Relevant portions of sections 4.1, 4.2, 4.4 4.7 and 4.10]</b> Joint probability distributions- discrete and continuous, marginal distributions, independent random variables. Expectation involving two or more random variables, covariance of pairs of random variables. Central limit theorem (without proof).	4 3 2	15%	
	<b>Random processes [Text 1: Relevant portions of sections 5.1, 5.2, 5.3 and 6.2]</b> Random processes, types of random processes, Mean, correlation and covariance functions of random processes, Wide Sense Stationary (WSS) process, Properties of autocorrelation and auto covariance functions of WSS processes. Power spectral density and its properties.	2 4 2		15%
	<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	<b>Special random processes [Text 1: Relevant portions of sections 5.5, 5.5.1, 5.5.2, 5.5.3, 5.5.4) and 5.6]</b> Poisson process-properties, probability distribution of inter arrival times. Discrete time Markov chain- Transition probability matrix, Chapman Kolmogorov theorem (without proof), computation of probability distribution and higher order transition probabilities, stationary distribution.	4 5	20%	
	<b>Numerical Methods [Text 2: Relevant portions of sections 19.2, 19.3, 19.5 and 21.1]</b> (Derivation of formulae not required in this module) Finding roots of equations-Newton-Raphson method. Interpolation-Newton's forward and backward difference formula, Lagrange's interpolation method. Numerical Integration-trapezoidal rule, Simpson's 1/3rd rule. Numerical solution of first order ODE-Euler method, Runge-Kutta fourth order (classical method).	3 3 3 3		20%
<b>END SEMESTER EXAM</b>				

**QUESTION PAPER PATTERN:**

Maximum Marks : 100

Exam Duration: 3 hours

The question paper will consist of 3 parts.

Part A will have 3 questions of 15 marks each uniformly covering modules I and II. Each question may have two sub questions.

Part B will have 3 questions of 15 marks each uniformly covering modules III and IV. Each question may have two sub questions.

Part C will have 3 questions of 20 marks each uniformly covering modules V and VI. Each question may have three sub questions.

Any two questions from each part have to be answered.

Course code	Course Name	L-T-P - Credits	Year of Introduction
EC202	SIGNALS & SYSTEMS	3-1-0 -4	2016
<b>Prerequisite: Nil</b>			
<b>Course Objectives</b>			
<ol style="list-style-type: none"> <li>1. To train students for an intermediate level of fluency with signals and systems in both continuous time and discrete time, in preparation for more advanced subjects in digital signal processing, image processing, communication theory and control systems.</li> <li>2. To study continuous and discrete-time signals and systems, their properties and representations and methods those are necessary for the analysis of continuous and discrete-time signals and systems.</li> <li>3. To familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems.</li> <li>4. To gain knowledge of time-domain representation and analysis concepts as they relate to differential equations, difference equations, impulse response and convolution, etc.</li> <li>5. To study frequency-domain representation and analysis concepts using Fourier analysis tools, Laplace Transform and Z-transform. To study concepts of the sampling process, reconstruction of signals and interpolation.</li> </ol>			
<b>Syllabus</b>			
Elementary signals, Continuous time and Discrete time signals and systems, Signal operations, Differential equation representation, Difference equation representation, Continuous time LTI Systems, Discrete time LTI Systems, Correlation between signals, Orthogonality of signals, Frequency domain representation, Continuous time Fourier series, Continuous time Fourier transform, Laplace transform, Inverse Laplace transform, Unilateral Laplace transform, Transfer function, Frequency response, Sampling, Aliasing, Z transform, Inverse Z transform, Unilateral Z transform, Frequency domain representation of discrete time signals, Discrete time Fourier series and discrete time Fourier transform (DTFT), Analysis of discrete time LTI systems using the above transforms			
<b>Expected outcome .</b>			
The student will be able to:			
<ol style="list-style-type: none"> <li>i. Define, represent, classify and characterize basic properties of continuous and discrete time signals and systems.</li> <li>ii. Represent the CT signals in Fourier series and interpret the properties of Fourier transform and Laplace transform</li> <li>iii. Outline the relation between convolutions, correlation and to describe the orthogonality of signals.</li> <li>iv. Illustrate the concept of transfer function and determine the magnitude and phase response of LTI systems.</li> <li>v. Explain sampling theorem and techniques for sampling and reconstruction.</li> <li>vi. Determine z transforms, inverse z transforms and analyze LTI systems using z transform.</li> </ol>			
<b>Text Book:</b>			
<ol style="list-style-type: none"> <li>1. Alan V. Oppenheim and Alan Willsky, Signals and Systems, PHI, 2/e, 2009</li> <li>2. Simon Haykin, Signals &amp; Systems, John Wiley, 2/e, 2003</li> </ol>			
<b>References:</b>			
<ol style="list-style-type: none"> <li>1. Anand Kumar, Signals and Systems, PHI, 3/e, 2013.</li> <li>2. B P. Lathi, Principles of Signal Processing &amp; Linear systems, Oxford University Press.</li> <li>3. Gurung, Signals and System, PHI.</li> <li>4. Mahmood Nahvi, Signals and System, Mc Graw Hill (India), 2015.</li> <li>5. P Ramakrishna Rao, Shankar Prakriya, Signals and System, MC Graw Hill Edn 2013.</li> </ol>			

6. Rodger E. Ziemer, Signals & Systems - Continuous and Discrete, Pearson, 4/e, 2013			
Course Plan			
Module	Contents	Hours	Sem. Exam Marks
I	Elementary Signals, Classification and representation of continuous time and discrete time signals, Signal operations	4	15%
	Continuous time and discrete time systems - Classification, Properties.	3	
	Representation of systems: Differential equation representation of continuous time systems. Difference equation representation of discrete systems.	2	
II	Continuous time LTI systems and convolution integral.	3	15%
	Discrete time LTI systems and linear convolution.	2	
	Stability and causality of LTI systems.	2	
	Correlation between signals, Orthogonality of signals.	2	
FIRST INTERNAL EXAMINATION			
III	Frequency domain representation of continuous time signals-continuous time Fourier series and its properties.	4	15%
	Convergence, Continuous time fourier transform and its properties.	3	
	Laplace Transform, ROC, Inverse transform, properties, unilateral Laplace transform.	3	
	Relation between Fourier and Laplace transforms.	1	
IV	Analysis of LTI systems using Laplace and Fourier transforms. Concept of transfer function, Frequency response, Magnitude and phase response.	4	15%
	Sampling of continuous time signals, Sampling theorem for lowpass signals, aliasing.	3	
SECOND INTERNAL EXAMINATION			
V	Z transform, ROC , Inverse transform, properties, Unilateral Z transform.	4	20%
	Frequency domain representation of discrete time signals, Discrete time fourier series and its properties.	4	
	Discrete time fourier transform (DTFT) and its properties	4	
VI	Relation between DTFT and Z-Transform, Analysis of discrete time LTI systems using Z transforms and DTFT, Transfer function, Magnitude and phase response.	6	20%
END SEMESTER EXAM			

**Assignment:** Convolution by graphical methods, Solution of differential equations.

**Project:** Use of Matlab in finding various transforms: magnitude and phase responses.

### Question Paper Pattern (End Sem Exam)

**Maximum Marks: 100**

**Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark pattern is according to the syllabus with maximum 30 % for theory and 70% for logical/numerical problems, derivation and proof.

Course code	Course Name	L-T-P - Credits	Year of Introduction
EC204	ANALOG INTEGRATED CIRCUITS	4-0-0-4	2016
<b>Prerequisite: Nil</b>			
<b>Course Objectives</b>			
<ul style="list-style-type: none"> <li>• To equip the students with a sound understanding of fundamental concepts of operational amplifiers</li> <li>• To understand the wide range of applications of operational amplifiers</li> <li>• To introduce special function integrated circuits</li> <li>To introduce the basic concepts and types of data converters</li> </ul>			
<b>Syllabus</b>			
Differential amplifier configurations, Operational amplifiers, Block diagram, Ideal op-amp parameters, Effect of finite open loop gain, bandwidth and slew rate on circuit performance, op-amp applications-linear and nonlinear, Active filters, Specialized ICs and their applications, Monolithic Voltage Regulators - types and its applications, Data converters - specifications and types.			
<b>Expected outcome .</b>			
The students will			
<ol style="list-style-type: none"> <li>i. have a thorough understanding of operational amplifiers</li> <li>ii. be able to design circuits using operational amplifiers for various applications</li> </ol>			
<b>Text Books:</b>			
<ol style="list-style-type: none"> <li>1. Franco S., Design with Operational Amplifiers and Analog Integrated Circuits, 3/e, Tata McGraw Hill, 2008</li> <li>2. Salivahanan S. ,V. S. K. Bhaaskaran, Linear Integrated Circuits, Tata McGraw Hill, 2008</li> </ol>			
<b>References:</b>			
<ol style="list-style-type: none"> <li>1. Botkar K. R., Integrated Circuits, 10/e, Khanna Publishers, 2010</li> <li>2. C.G. Clayton, Operational Amplifiers, Butterworth &amp; Company Publ. Ltd. Elsevier, 1971<sup>nd</sup></li> <li>3. David A. Bell, Operational Amplifiers &amp; Linear ICs, Oxford University Press, 2<sup>nd</sup> edition, 2010</li> <li>4. Gayakwad R. A., Op-Amps and Linear Integrated Circuits, Prentice Hall, 4/e, 2010</li> <li>5. R.F. Coughlin &amp; Fredrick Driscoll, Operational Amplifiers &amp; Linear Integrated Circuits, 6<sup>th</sup> Edition, PHI,2001</li> <li>6. Roy D. C. and S. B. Jain, Linear Integrated Circuits, New Age International, 3/e, 2010</li> <li>7. Sedra A. S. and K. C. Smith, Microelectronic Circuits, 6/e, Oxford University Press, 2013</li> </ol>			
<b>Course Plan</b>			
Module	Contents	Hours	Sem. Exam Marks
<b>I</b>	Differential amplifiers: Differential amplifier configurations using BJT, Large and small signal operations, Input resistance, Voltage gain, CMRR, Non-ideal characteristics of differential amplifier. Frequency response of differential amplifiers, Current sources, Active load, Concept of current mirror circuits, Wilson current mirror circuits (Analysis using hybrid 'pi' model only).	6	15%
	Operational amplifiers: Introduction, Block diagram, Ideal op-amp parameters, Equivalent circuit, Voltage transfer curve, Open loop op-amp configurations, Effect of finite open loop gain, Bandwidth and slew rate on circuit performance	5	
<b>II</b>	Op-amp with negative feedback: Introduction, Feedback	3	15%

	configurations, Voltage series feedback, Voltage shunt feedback, Properties of practical op-amp.		
	Op-amp applications: Inverting and non inverting amplifier, DC and AC amplifiers, Summing, Scaling and averaging amplifiers, Instrumentation amplifier.	4	
<b>FIRST INTERNAL EXAMINATION</b>			
<b>III</b>	Op-amp applications: Voltage to current converter, Current to voltage converter, Integrator, Differentiator, Precision rectifiers, Log and antilog amplifier, Phase shift and Wien bridge oscillators	7	15%
<b>IV</b>	Astable and monostable multivibrators, Triangular and saw tooth wave generators, Comparators, Zero crossing detector, Schmitt trigger	5	15%
	Active filters: Advantages, First and second order low pass, High pass, Band pass and band reject filters, Design of filters using Butterworth approximations	5	
<b>SECOND INTERNAL EXAMINATION</b>			
<b>V</b>	Specialized ICs and its applications: Timer IC 555 : Astable and monostable operations, applications. Analog Multipliers: Introduction, Gilbert multiplier cell. Voltage Controlled Oscillator IC AD633 and their applications.	3	20%
	Phase Locked Loop – Operation, Closed loop analysis, Lock and capture range, Basic building blocks, PLL IC 565, Applications of PLL for AM & FM detection and Frequency multiplication, Frequency division, Frequency synthesizing.	4	
	Monolithic Voltage Regulators - Fixed voltage regulators, 78XX and 79XX series, Adjustable voltage regulators, IC 723 – Low voltage and high voltage configurations, Current boosting, Current limiting, Short circuit and Fold-back protection.	4	
<b>VI</b>	Data Converters: D/A converter, Specifications, Weighted resistor type, R-2R Ladder type.	3	20%
	A/D Converters: Specifications, Classification, Flash type, Counter ramp type, Successive approximation type, Single slope type, Dual slope type, Sample-and-hold circuits.	5	
<b>END SEMESTER EXAM</b>			

**Assignment**

1. Explain the importance of frequency compensated networks in opamps and the commonly used compensation techniques.
2. Write short notes on commercially available integrated circuits (Opamp, ADC, DAC, VCO, Analog multiplier, PLL ) with pin outs and their important features

**Question Paper Pattern (End Sem Exam)****Maximum Marks: 100****Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark patterns are as per the syllabus with maximum 60 % for theory and 40% for logical/numerical problems, derivation and proof.

Course code	Course Name	L-T-P - Credits	Year of Introduction
EC206	COMPUTER ORGANISATION	3-0-0-3	2016
<b>Prerequisite:</b> EC207 Logic Circuit Design			
<b>Course Objectives</b>			
<ul style="list-style-type: none"> <li>To impart knowledge in computer architecture.</li> <li>To impart knowledge in machine language programming.</li> <li>To develop understanding on I/O accessing techniques and memory structures.</li> </ul>			
<b>Syllabus</b>			
Functional units of a computer, Arithmetic circuits, Processor architecture, Instructions and addressing modes, Execution of program, Micro architecture design process, Design of data path and control units, I/O accessing techniques, Memory concepts, Memory interface, Cache and Virtual memory concepts.			
<b>Expected outcome .</b>			
The students will be able to:			
<ol style="list-style-type: none"> <li>Understand the functional units of a computer</li> <li>Identify the different types of instructions</li> <li>Understand the various addressing modes</li> <li>Understand the I/O addressing system</li> <li>Categorize the different types of memories</li> </ol>			
<b>Text Books:</b>			
<ol style="list-style-type: none"> <li>David A. Patterson and John L. Hennessey, Computer Organisation and Design, Fourth Edition, Morgan Kaufmann</li> <li>David Money Harris, Sarah L Harris, Digital Design and Computer Architecture, M Kaufmann – Elsevier, 2009</li> </ol>			
<b>References</b>			
<ol style="list-style-type: none"> <li>Carl Hamacher : “Computer Organization ”, Fifth Edition, Mc Graw Hill</li> <li>John P Hayes: “Computer Architecture and Organisation”, Mc Graw Hill</li> <li>William Stallings: “Computer Organisation and Architecture”, Pearson Education</li> <li>Andrew S Tanenbaum: “Structured Computer Organisation”, Pearson Education</li> <li>Craig Zacker: “PC Hardware : The Complete Reference”, TMH</li> </ol>			
<b>Course Plan</b>			
Module	Contents	Hours	Sem. Exam Marks
I	Functional units of a computer Arithmetic Circuits: Adder-carry propagate adder, Ripple carry adder, Basics of carry look ahead and prefix adder, Subtractor, Comparator, ALU	4	15%
	Shifters and rotators, Multiplication, Division	3	
	Number System: Review of Fixed point & Floating point number system	1	
II	Architecture : Assembly Language, Instructions, Operands, Registers, Register set, Memory, Constants	2	15%
	Machine Language: R-Type, I-Type, J-Type Instructions, Interpreting machine language code	3	
<b>FIRST INTERNAL EXAMINATION</b>			
III	<b>MIPS</b> Addressing modes – Register only, Immediate, Base, PC-relative, Pseudo - direct	3	15%

	MIPS memory map, Steps for executing a program - Compilation, Assembling, Linking, Loading	3	
	Pseudo instructions, Exceptions, Signed and Unsigned instructions, Floating point instructions	3	
IV	MIPS Microarchitectures – State elements of MIPS processor	1	15%
	Design process and performance analysis of Single cycle processor, Single cycle data path, Single cycle control for R – type arithmetic/logical instructions.	3	
	Design process and performance analysis of multi cycle processor, Multi cycle data path, Multi cycle control for R – type arithmetic/logical instructions.	3	
<b>SECOND INTERNAL EXAMINATION</b>			
V	I/O system – Accessing I/O devices, Modes of data transfer, Programmed I/O, Interrupt driven I/O, Direct Memory Access, Standard I/O interfaces – Serial port, Parallel port, PCI, SCSI, and USB.	3	20%
	Memory system – Hierarchy, Characteristics and Performance analysis, Semiconductor memories (RAM, ROM, EPROM), Memory Cells – SRAM and DRAM, internal organization of a memory chip, Organization of a memory unit.	4	
VI	Cache Memory – Concept/principle of cache memory, Cache size, mapping methods – direct, associated, set associated, Replacement algorithms, Write policy- Write through, Write back.	3	20%
	Virtual Memory – Memory management, Segmentation, Paging, Address translation, Page table, Translation look aside buffer.	3	
<b>END SEMESTER EXAM</b>			

### Question Paper Pattern (End Sem Exam)

**Maximum Marks: 100**

**Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark patterns are as per the syllabus with maximum 80 % for theory and 20% for logical/numerical problems, derivation and proof.

Course code	Course Name	L-T-P - Credits	Year of Introduction
EC208	ANALOG COMMUNICATION ENGINEERING	3-0-0-3	2016
<b>Prerequisite:</b> EC205 Electronic Circuits			
<b>Course Objectives</b>			
<ul style="list-style-type: none"> <li>• To study the concepts and types of modulation schemes.</li> <li>• To study different types of radio transmitters and receivers.</li> <li>• To study the effects of noise in analog communication systems. To impart basic knowledge on public telephone systems.</li> </ul>			
<b>Syllabus</b>			
Elements of communication system, Need for modulation, Noises, Amplitude Modulation, Amplitude modulator circuits, Demodulator circuits, AM transmitters, Types of AM, Angle modulation: principles of frequency modulation, phase modulation, AM and FM Receivers, Frequency modulator circuits, FM transmitters, FM receiver, Noise in AM and FM systems, Public telephone systems, standard telephone set, cordless telephones.			
<b>Expected outcome .</b>			
The students will be able to:			
<ol style="list-style-type: none"> <li>i. understand the different analog modulation schemes.</li> <li>ii. understand the fundamental ideas of noises and its effect in communication systems.</li> <li>iii. explain the principle and working of analog transmitters and receivers.</li> <li>iv. know the basic idea of telephone systems.</li> </ol>			
<b>Text Books:</b>			
<ol style="list-style-type: none"> <li>1. Dennis Roody and John Coolen, Electronic Communication, Pearson, 4/e, 2011.</li> <li>2. George Kennedy, Electronic Communication Systems, McGrawHill, 4/e, 2008.</li> <li>3. Tomasi, Electronic Communications System , Pearson, 5/e, 2011.</li> </ol>			
<b>References:</b>			
<ol style="list-style-type: none"> <li>1. Blake, Electronic Communication system, Cengage, 2/e, 2012.</li> <li>2. Simon Haykin, Communication Systems, Wiley 4/e, 2006.</li> <li>3. Taub, Schilling, Saha, Principles of communication system, McGraw Hill, 2013.</li> <li>4. Tomasi, Advanced Electronic Communications Systems, Pearson, 6/e, 2012.</li> </ol>			
<b>Course Plan</b>			
Module	Contents	Hours	Sem. Exam Marks
I	Introduction, Elements of communication systems, Need for modulation	2	15%
	Noise in communication system, Thermal noise (white noise), Shot noise, Partition noise, Flicker noise, Burst noise, Signal to noise ratio, Noise factor, Noise temperature, Narrow band noise.	3	
II	Amplitude modulation: Sinusoidal AM, Modulation index, Average power, Effective voltage and current, Nonsinusoidal modulation.	4	15%
	Amplitude modulator circuits, Amplitude demodulator circuits, AM transmitters, Noise in AM Systems.	5	
<b>FIRST INTERNAL EXAMINATION</b>			
III	Single Sideband Modulation: Principles, Balanced modulators, Singly & doubly balanced modulators, SSB generation, Filter method, Phasing method & Third method, SSB reception, Modified SSB systems, Pilot carrier SSB & ISB, Companded SSB.	6	15%



IV	Angle modulation: Frequency modulation, Sinusoidal FM, Frequency spectrum, Modulation index, Average power, Non-sinusoidal modulation, Deviation ratio, Comparison of AM and FM.	4	15%
	AM & FM Receivers: Super heterodyne receiver, Tuning range, Tracking, Sensitivity and gain, Image rejection, Double conversion, Adjacent channel selectivity, Automatic Gain Control (AGC).	4	
<b>SECOND INTERNAL EXAMINATION</b>			
V	Phase modulation, Equivalence between PM and FM, Sinusoidal phase modulation, Digital phase modulation.	3	20%
	Angle modulator Circuits: Varactor diode modulators, Transistor modulators. FM Transmitters: Direct and Indirect Methods.	3	
VI	Angle modulation detectors, Slope detector, Balanced slope detector, Foster-Seeley discriminator, PLL demodulator, Automatic Frequency Control (AFC), Amplitude limiters, Noise in FM systems, Pre-emphasis and De-emphasis.	4	20%
	Telephone systems, standard telephone set, basic call procedures and tones, DTMF, cordless telephones.	4	
<b>END SEMESTER EXAM</b>			

**Assignment**

Study of

1. The telephone circuit - Local subscriber loop, Private-line circuits, Voice-frequency circuit arrangements.
2. The public telephone network - Instruments, Local loops, Trunk circuits and exchanges, Local central exchanges, Automated central office switches and exchanges.

**Question Paper Pattern (End Sem Exam)****Maximum Marks: 100****Time : 3 hours**

The question paper shall consist of three parts. Part A covers modules I and II, Part B covers modules III and IV, and Part C covers modules V and VI. Each part has three questions uniformly covering the two modules and each question can have maximum four subdivisions. In each part, any two questions are to be answered. Mark patterns are as per the syllabus with maximum 60 % for theory and 40% for logical/numerical problems, derivation and proof.

Course code	Course Name	L-T-P - Credits	Year of Introduction
HS200	Business Economics	3-0-0-3	2016
<b>Prerequisite: Nil</b>			
<b>Course Objectives</b> <ul style="list-style-type: none"> <li>To familiarize the prospective engineers with elementary Principles of Economics and Business Economics.</li> <li>To acquaint the students with tools and techniques that are useful in their profession in Business Decision Making which will enhance their employability;</li> <li>To apply business analysis to the “firm” under different market conditions;</li> <li>To apply economic models to examine current economic scenario and evaluate policy options for addressing economic issues</li> <li>To gain understanding of some Macroeconomic concepts to improve their ability to understand the business climate;</li> <li>To prepare and analyse various business tools like balance sheet, cost benefit analysis and rate of returns at an elementary level</li> </ul>			
<b>Syllabus</b> Business Economics - basic concepts, tools and analysis, scarcity and choices , resource allocation, marginal analysis, opportunity costs and production possibility curve. Fundamentals of microeconomics - Demand and Supply Analysis, equilibrium, elasticity, production and production function, cost analysis, break-even analysis and markets. Basics of macroeconomics - the circular flow models, national income analysis, inflation, trade cycles, money and credit, and monetary policy. Business decisions - investment analysis, Capital Budgeting decisions, forecasting techniques and elementary Balance Sheet and taxation, business financing, international investments			
<b>Expected outcome .</b> A student who has undergone this course would be able to <ol style="list-style-type: none"> <li>make investment decisions based on capital budgeting methods in alignment with microeconomic and macroeconomic theories.</li> <li>able to analyse the profitability of the firm, economy of operation, determination of price under various market situations with good grasp on the effect of trade cycles in business.</li> <li>gain knowledge on Monetary theory, measures by RBI in controlling interest rate and emerging concepts like Bit Coin.</li> <li>gain knowledge of elementary accounting concepts used for preparing balance sheet and interpretation of balance sheet</li> </ol>			
<b>Text Books</b> <ol style="list-style-type: none"> <li>Geetika, Piyali Ghosh and Chodhury, <i>Managerial Economics</i>, Tata McGraw Hill, 2015</li> <li>Gregory Mankiw, <i>Principles of Macroeconomics</i>, Cengage Learning, 2006.</li> <li>M.Kasi Reddy and S.Saraswathi, <i>Economics and Financial Accounting</i>. Prentice Hall of India. New Delhi.</li> </ol>			

**References:**

1. Dornbusch, Fischer and Startz, *Macroeconomics*, McGraw Hill, 11th edition, 2010.
2. Khan M Y, *Indian Financial System*, Tata McGraw Hill, 7th edition, 2011.
3. Samuelson, *Managerial Economics*, 6<sup>th</sup> edition, Wiley
4. Snyder C and Nicholson W, *Fundamentals of Microeconomics*, Cengage Learning (India), 2010.
5. Truett, *Managerial Economics: Analysis, Problems, Cases*, 8<sup>th</sup> Edition, Wiley
6. Welch, *Economics: Theory and Practice* 7<sup>th</sup> Edition, Wiley
7. Uma Kapila, *Indian Economy Since Independence, 26th Edition: A Comprehensive and Critical Analysis of India's Economy, 1947-2015*
8. C Rangarajan, *Indian Economy, Essays on monetary and finance*, UBS Publishers'Distributors, 1998
9. A.Ramachandra Aryasri, *Managerial Economics and Financial Analysis*, Tata McGraw-Hill, New Delhi.
10. Dominick Salvatore, *Managerial Economics in Global Economy*, Thomas Western College Publishing, Singapore.
11. I.M .Pandey, *Financial Management*, Vikas Publishing House. New Delhi.
12. Dominick Salvatore, *Theory and Problems of Micro Economic Theory*. Tata Mac Graw-Hill, New Delhi.
13. T.N.Hajela. *Money, Banking and Public Finance*. Anne Books. New Delhi.
14. G.S.Gupta. *Macro Economics-Theory and Applications*. Tata Mac Graw- Hill, New Delhi.
15. Yogesh, Maheswari, *Management Economics* , PHI learning, NewDelhi, 2012
16. Timothy Taylor , *Principles of Economics*, 3<sup>rd</sup>edition, TEXTBOOK MEDIA.
17. Varshney and Maheshwari. *Managerial Economics*. Sultan Chand. New Delhi

**Course Plan**

Module	Contents	Hours	Sem. Exam Marks
I	<b>Business Economics</b> and its role in managerial decision making-meaning-scope-relevance-economic problems-scarcity Vs choice (2 Hrs)-Basic concepts in economics-scarcity, choice, resource allocation- Trade-off-opportunity cost-marginal analysis- marginal utility theory, Law of diminishing marginal utility -production possibility curve (2 Hrs)	4	15%
II	<b>Basics of Micro Economics I</b> Demand and Supply analysis-equilibrium-elasticity (demand and supply) (3 Hrs.) -Production concepts-average product-marginal product-law of variable proportions- Production function-Cobb Douglas function-problems (3 Hrs.)	6	15%
<b>FIRST INTERNAL EXAMINATION</b>			
III	<b>Basics of Micro Economics II</b> Concept of costs-marginal, average, fixed, variable costs-cost curves-shut down point-long run and short run (3 Hrs.)- Break Even Analysis-Problem-Markets-Perfect Competition, Monopoly and Monopolistic Competition, Oligopoly-Cartel and collusion (3 Hrs.).	6	15%
IV	<b>Basics of Macro Economics</b> - Circular flow of income-two sector and multi-sector models- National Income Concepts-Measurement methods-problems-Inflation, deflation (4 Hrs.)-Trade cycles-Money-stock and flow concept-Quantity theory of money-Fischer's Equation and Cambridge Equation -velocity of circulation of money-credit control methods-SLR, CRR, Open Market Operations-Repo and Reverse Repo rate-emerging concepts in money-bit coin (4 Hrs.).	8	15%

SECOND INTERNAL EXAMINATION			
V	<b>Business Decisions I</b> -Investment analysis-Capital Budgeting-NPV, IRR, Profitability Index, ARR, Payback Period (5 Hrs.)- Business decisions under certainty-uncertainty-selection of alternatives-risk and sensitivity- cost benefit analysis-resource management (4 Hrs.).	9	20%
VI	<b>Business Decisions II</b> Balance sheet preparation-principles and interpretation-forecasting techniques (7 Hrs.)-business financing-sources of capital- Capital and money markets-international financing-FDI, FPI, FII-Basic Principles of taxation-direct tax, indirect tax-GST (2 hrs.).	9	20%
<b>END SEMESTER EXAM</b>			

### Question Paper Pattern

Max. marks: 100, Time: 3 hours

The question paper shall consist of three parts

#### **Part A**

4 questions uniformly covering modules I and II. Each question carries 10 marks  
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

#### **Part B**

4 questions uniformly covering modules III and IV. Each question carries 10 marks  
Students will have to answer any three questions out of 4 (3X10 marks =30 marks)

#### **Part C**

6 questions uniformly covering modules V and VI. Each question carries 10 marks  
Students will have to answer any four questions out of 6 (4X10 marks =40 marks)

**Note:** In all parts, each question can have a maximum of four sub questions, if needed.

Course code	Course Name	L-T-P-Credits	Year of Introduction
HS210	LIFE SKILLS	2-0-2	2016
<b>Prerequisite : Nil</b>			
<p><b>Course Objectives</b></p> <ul style="list-style-type: none"> <li>To develop communication competence in prospective engineers.</li> <li>To enable them to convey thoughts and ideas with clarity and focus.</li> <li>To develop report writing skills.</li> <li>To equip them to face interview &amp; Group Discussion.</li> <li>To inculcate critical thinking process.</li> <li>To prepare them on problem solving skills.</li> <li>To provide symbolic, verbal, and graphical interpretations of statements in a problem description.</li> <li>To understand team dynamics &amp; effectiveness.</li> <li>To create an awareness on Engineering Ethics and Human Values.</li> <li>To instill Moral and Social Values, Loyalty and also to learn to appreciate the rights of others.</li> <li>To learn leadership qualities and practice them.</li> </ul>			
<p><b>Syllabus</b></p> <p><b>Communication Skill:</b> Introduction to Communication, The Process of Communication, Barriers to Communication, Listening Skills, Writing Skills, Technical Writing, Letter Writing, Job Application, Report Writing, Non-verbal Communication and Body Language, Interview Skills, Group Discussion, Presentation Skills, Technology-based Communication.</p> <p><b>Critical Thinking &amp; Problem Solving:</b> Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats, Mind Mapping &amp; Analytical Thinking.</p> <p><b>Teamwork:</b> Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance &amp; Team Conflicts.</p> <p><b>Ethics, Moral &amp; Professional Values:</b> Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE.</p> <p><b>Leadership Skills:</b> Leadership, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid &amp; leadership Formulation.</p>			
<p><b>Expected outcome</b></p> <p>The students will be able to</p> <ul style="list-style-type: none"> <li>Communicate effectively.</li> <li>Make effective presentations.</li> <li>Write different types of reports.</li> <li>Face interview &amp; group discussion.</li> <li>Critically think on a particular problem.</li> <li>Solve problems.</li> <li>Work in Group &amp; Teams</li> <li>Handle Engineering Ethics and Human Values.</li> <li>Become an effective leader.</li> </ul>			

**Resource Book:**

*Life Skills for Engineers*, Compiled by ICT Academy of Kerala, McGraw Hill Education (India) Private Ltd., 2016

**References:**

- Barun K. Mitra; (2011), “*Personality Development & Soft Skills*”, First Edition; Oxford Publishers.
- Kalyana; (2015) “*Soft Skill for Managers*”; First Edition; Wiley Publishing Ltd.
- Larry James (2016); “*The First Book of Life Skills*”; First Edition; Embassy Books.
- Shalini Verma (2014); “*Development of Life Skills and Professional Practice*”; First Edition; Sultan Chand (G/L) & Company
- John C. Maxwell (2014); “*The 5 Levels of Leadership*”, Centre Street, A division of Hachette Book Group Inc.

**Course Plan**

Module	Contents	Hours L-T-P		Sem. Exam Marks
		L	P	
I	Need for Effective Communication, Levels of communication; Flow of communication; Use of language in communication; Communication networks; Significance of technical communication, Types of barriers; Miscommunication; Noise; Overcoming measures,	2		See evaluation scheme
	Listening as an active skill; Types of Listeners; Listening for general content; Listening to fill up information; Intensive Listening; Listening for specific information; Developing effective listening skills; Barriers to effective listening skills.		2	
	<b>Technical Writing:</b> Differences between technical and literary style, Elements of style; Common Errors, <b>Letter Writing:</b> Formal, informal and demi-official letters; business letters, <b>Job Application:</b> Cover letter, Differences between bio-data, CV and Resume, <b>Report Writing:</b> Basics of Report Writing; Structure of a report; Types of reports.		4	
	<b>Non-verbal Communication and Body Language:</b> Forms of non-verbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of body language	3		
	<b>Interview Skills:</b> Types of Interviews; Ensuring success in job interviews; Appropriate use of non-verbal communication, <b>Group Discussion:</b> Differences between group discussion and debate; Ensuring success in group discussions, <b>Presentation Skills:</b> Oral presentation and public speaking skills; business presentations, <b>Technology-based Communication:</b> Netiquettes: effective e-mail messages; power-point presentation; enhancing editing skills using computer software.		4	

<p><b>II</b></p>	<p>Need for Creativity in the 21<sup>st</sup> century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity</p> <p>Critical thinking Vs Creative thinking, Functions of Left Brain &amp; Right brain, Convergent &amp; Divergent Thinking, Critical reading &amp; Multiple Intelligence.</p> <p>Steps in problem solving, Problem Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections.</p> <p>Problem Solving strategies, Analytical Thinking and quantitative reasoning expressed in written form, Numeric, symbolic, and graphic reasoning, Solving application problems.</p>	<p>2</p> <p>2</p> <p>2</p>	<p>2</p> <p>2</p>	
<p><b>III</b></p>	<p>Introduction to Groups and Teams, Team Composition, Managing Team Performance, Importance of Group, Stages of Group, Group Cycle, Group thinking, getting acquainted, Clarifying expectations.</p> <p>Group Problem Solving, Achieving Group Consensus.</p> <p>Group Dynamics techniques, Group vs Team, Team Dynamics, Teams for enhancing productivity, Building &amp; Managing Successful Virtual Teams. Managing Team Performance &amp; Managing Conflict in Teams.</p> <p>Working Together in Teams, Team Decision-Making, Team Culture &amp; Power, Team Leader Development.</p>	<p>3</p> <p>3</p> <p>3</p>	<p>2</p> <p>2</p>	
<p><b>IV</b></p>	<p>Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully.</p> <p>Caring, Sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character</p> <p>Spirituality, Senses of 'Engineering Ethics', variety of moral issued, Types of inquiry, moral dilemmas, moral autonomy, Kohlberg's theory, Gilligan's theory, Consensus and controversy, Models of Professional Roles, Theories about right action, Self-interest, customs and religion, application of ethical theories.</p> <p>Engineering as experimentation, engineers as responsible experimenters, Codes of ethics, Balanced outlook on.</p> <p>The challenger case study, Multinational corporations, Environmental ethics, computer ethics,</p>	<p>3</p> <p>3</p> <p>3</p>	<p>2</p> <p>2</p>	

	Weapons development, engineers as managers, consulting engineers, engineers as expert witnesses and advisors, moral leadership, sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers(India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE), India, etc.	3		
V	Introduction, a framework for considering leadership, entrepreneurial and moral leadership, vision, people selection and development, cultural dimensions of leadership, style, followers, crises.	4	2	
	Growing as a leader, turnaround leadership, gaining control, trust, managing diverse stakeholders, crisis management			
	Implications of national culture and multicultural leadership Types of Leadership, Leadership Traits.	2		
	Leadership Styles, VUCA Leadership, DART Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders, making of a Leader, Formulate Leadership		2	
<b>END SEMESTER EXAM</b>				

### EVALUATION SCHEME

#### Internal Evaluation

*(Conducted by the College)*

**Total Marks: 100**

#### Part – A

*(To be started after completion of Module 1 and to be completed by 30<sup>th</sup> working day of the semester)*

1. Group Discussion – Create groups of about 10 students each and engage them on a GD on a suitable topic for about 20 minutes. Parameters to be used for evaluation is as follows;

- |       |                        |   |          |
|-------|------------------------|---|----------|
| (i)   | Communication Skills   | – | 10 marks |
| (ii)  | Subject Clarity        | – | 10 marks |
| (iii) | Group Dynamics         | - | 10 marks |
| (iv)  | Behaviors & Mannerisms | - | 10 marks |

*(Marks: 40)*



**Part – B**

*(To be started from 31<sup>st</sup> working day and to be completed before 60<sup>th</sup> working day of the semester)*

2. Presentation Skills – Identify a suitable topic and ask the students to prepare a presentation (preferably a power point presentation) for about 10 minutes. Parameters to be used for evaluation is as follows;

(i)	Communication Skills*	-	10 marks
(ii)	Platform Skills**	-	10 marks
(iii)	Subject Clarity/Knowledge	-	10 marks

*(Marks: 30)*

\* Language fluency, audibility, voice modulation, rate of speech, listening, summarizes key learnings etc.

\*\* Postures/Gestures, Smiles/Expressions, Movements, usage of floor area etc.

**Part – C**

*(To be conducted before the termination of semester)*

3. Sample Letter writing or report writing following the guidelines and procedures. Parameters to be used for evaluation is as follows;

(i)	Usage of English & Grammar	-	10 marks
(ii)	Following the format	-	10 marks
(iii)	Content clarity	-	10 marks

*(Marks: 30)*

**External Evaluation**  
*(Conducted by the University)*

Total Marks: 50

Time: 2 hrs.

**Part – A****Short Answer questions**

There will be one question from each area (five questions in total). Each question should be written in about maximum of 400 words. Parameters to be used for evaluation are as follows;

- (i) Content Clarity/Subject Knowledge
- (ii) Presentation style
- (iii) Organization of content

(Marks: 5 x 6 = 30)

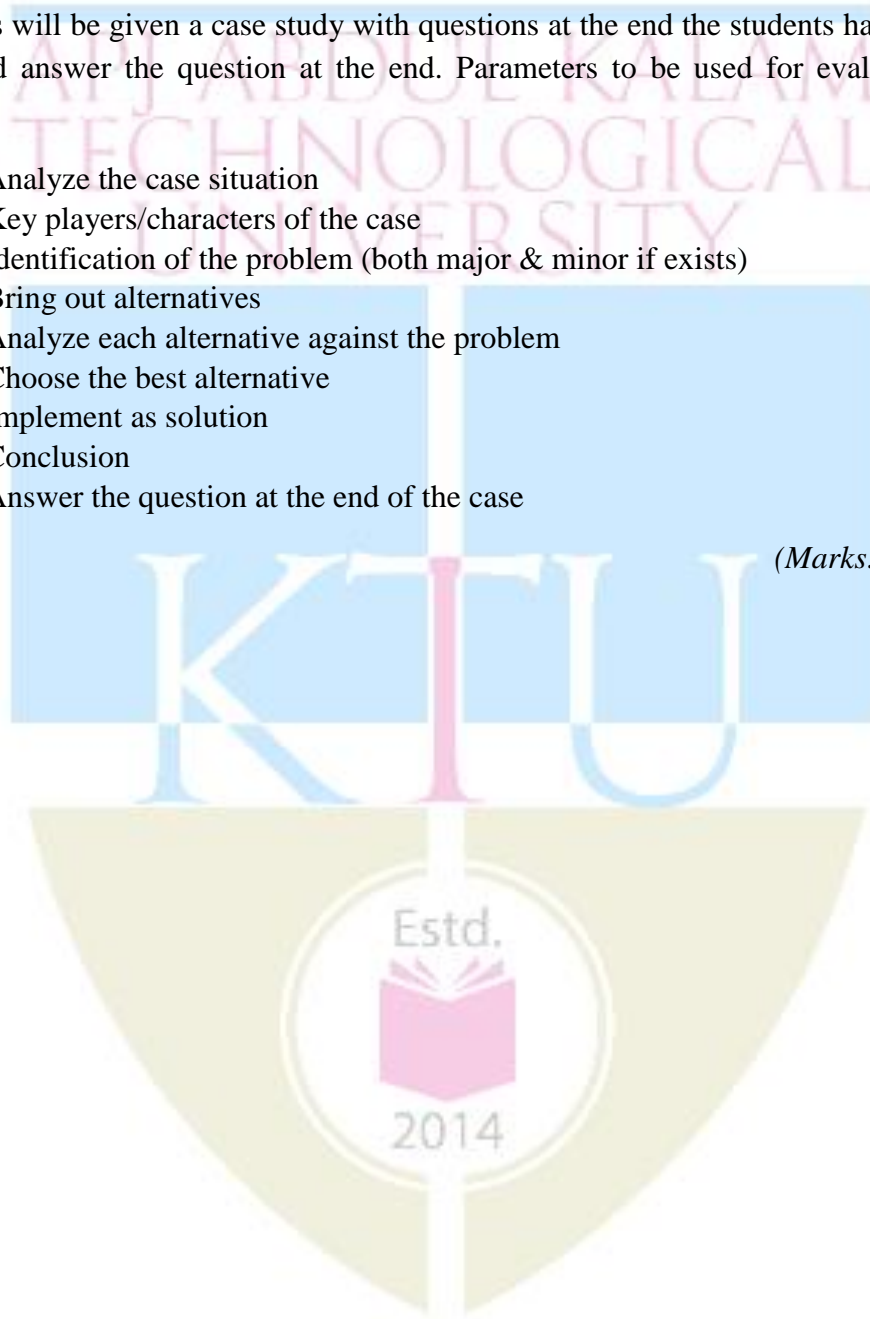
## Part – B

### Case Study

The students will be given a case study with questions at the end the students have to analyze the case and answer the question at the end. Parameters to be used for evaluation are as follows;

- (i) Analyze the case situation
- (ii) Key players/characters of the case
- (iii) Identification of the problem (both major & minor if exists)
- (iv) Bring out alternatives
- (v) Analyze each alternative against the problem
- (vi) Choose the best alternative
- (vii) Implement as solution
- (viii) Conclusion
- (ix) Answer the question at the end of the case

(Marks: 1 x 20 = 20)



COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC230	LOGIC CIRCUIT DESIGN LAB	0-0-3-1	2016
<b>Prerequisite:</b> EC207 Logic circuit design			
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>• To study the working of standard digital ICs and basic building blocks</li> <li>• To design and implement combinational circuits</li> <li>• To design and implement sequential circuits</li> </ul>			
<b>List of Experiments: -(Minimum 12 experiments are to be done)</b>			
<ol style="list-style-type: none"> <li>1. Realization of functions using basic and universal gates (SOP and POS forms).</li> <li>2. Design and Realization of half /full adder and subtractor using basic gates and universal gates.</li> <li>3. 4 bit adder/subtractor and BCD adder using 7483.</li> <li>4. 2/3 bit binary comparator.</li> <li>5. Binary to Gray and Gray to Binary converters.</li> <li>6. Study of Flip Flops: S-R, D, T, JK and Master Slave JK FF using NAND gates</li> <li>7. Asynchronous Counter: Realization of 4-bit counter</li> <li>8. Asynchronous Counter: Realization of Mod-N counters.</li> <li>9. Asynchronous Counter:3 bit up/down counter</li> <li>10. Synchronous Counter: Realization of 4-bit up/down counter.</li> <li>11. Synchronous Counter: Realization of Mod-N counters.</li> <li>12. Synchronous Counter:3 bit up/down counter</li> <li>13. Shift Register: Study of shift right, SIPO, SISO, PIPO, PISO (using FF &amp; 7495)</li> <li>14. Ring counter and Johnson Counter. (using FF &amp; 7495)</li> <li>15. Realization of counters using IC's (7490, 7492, 7493).</li> <li>16. Multiplexers and De-multiplexers using gates and ICs. (74150, 74154),</li> <li>17. Realization of combinational circuits using MUX &amp; DEMUX.</li> <li>18. Random sequence generator.</li> <li>19. LED Display: Use of BCD to 7 Segment decoder / driver chip to drive LED display</li> <li>20. Static and Dynamic Characteristic of NAND gate (MOS/TTL)</li> </ol>			
<b>Expected outcome:</b>			
The student should able to:			
<ol style="list-style-type: none"> <li>1. Design and demonstrate functioning of various combination circuits</li> <li>2. Design and demonstrate functioning of various sequential circuits</li> <li>3. Function effectively as an individual and in a team to accomplish the given task</li> </ol>			

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC232	ANALOG INTEGRATED CIRCUITS LAB	0-0-3-1	2016
<b>Prerequisite:</b> ..Should have registered for EC204 Analog Integrated Circuits			
<b>Course objectives:</b>			
<ul style="list-style-type: none"> <li>• To acquire skills in designing and testing analog integrated circuits</li> <li>• To expose the students to a variety of practical circuits using various analog ICs.</li> </ul>			
<b>List of Experiments: (Minimum 12 experiments are to be done)</b>			
<ol style="list-style-type: none"> <li>1. Familiarization of Operational amplifiers - Inverting and Non inverting amplifiers, frequency response, Adder, Integrator, comparators.</li> <li>2. Measurement of Op-Amp parameters.</li> <li>3. Difference Amplifier and Instrumentation amplifier.</li> <li>4. Schmitt trigger circuit using Op –Amps.</li> <li>5. Astable and Monostable multivibrator using Op -Amps.</li> <li>6. Timer IC NE555</li> <li>7. Triangular and square wave generators using Op- Amps.</li> <li>8. Wien bridge oscillator using Op-Amp - without &amp; with amplitude stabilization.</li> <li>9. RC Phase shift Oscillator.</li> <li>10. Precision rectifiers using Op-Amp.</li> <li>11. Active second order filters using Op-Amp (LPF, HPF, BPF and BSF).</li> <li>12. Notch filters to eliminate the 50Hz power line frequency.</li> <li>13. IC voltage regulators.</li> <li>14. A/D converters- counter ramp and flash type.</li> <li>15. D/A Converters- ladder circuit.</li> <li>16. Study of PLL IC: free running frequency lock range capture range</li> </ol>			
<b>Expected outcome:</b>			
The student should able to:			
<ol style="list-style-type: none"> <li>1. Design and demonstrate functioning of various analog circuits</li> <li>2. Students will be able to analyze and design various applications of analog circuits.</li> </ol>			