APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

B.Tech Degree

Semesters III & IV

2016

APJ ABDUL KALAM TECHNOLOGICAL UNIVERSITY

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BRANCH: *Electronics & Communication Engineering*

SEMESTER - 3

Course Code	***Course Name***	***L-T-P***	***Credits***	***Exam Slot***
MA201	Linear Algebra & Complex Analysis	3-1-0	4	A
EC201	Network Theory	3-1-0	4	B
EC203	Solid State Devices	3-1-0	4	C
EC205	Electronic Circuits	3-1-0	4	D
EC207	Logic Circuit Design	3-0-0	3	E
HS200/ HS210	Business Economics/Life Skills	3-0-0/ 2-0-2	3	F
EC231	Electronic Devices & Circuits Lab	0-0-3	1	S
EC223	Electronic Design Automation Lab	0-0-3	1	T

Total Credits = 24 Hours: 28/29

Cumulative Credits= 71

SEMESTER - 4

Course Code	***Course Name***	***L-T-P***	***Credits***	***Exam Slot***
MA204	Probability, Random Processes and Numerical Methods	3-1-0	4	A
EC202	Signals & Systems	3-1-0	4	B
EC204	Analog Integrated Circuits	4-0-0	4	C
EC206	Computer Organization	3-0-0	3	D
EC208	Analog Communication Engineering	3-0-0	3	E
HS210/ HS200	Life Skills/Business Economics	2-0-2/ 3-0-0	3	F
EC232	Analog Integrated Circuits Lab	0-0-3	1	S
EC230	Logic Circuit Design Lab	0-0-3	1	T

Total Credits = 23 Hours 27/28

Cumulative Credits= 94

Course No.	Course Name	L-T-P - Credits	Year of Introduction
MA201	LINEAR ALGEBRA AND COMPLEX ANALYSIS	3-1-0-4	2016

Prerequisite : Nil

Course Objectives

COURSE OBJECTIVES

- To equip the students with methods of solving a general system of linear equations.
- To familiarize them with the concept of Eigen values and diagonalization of a matrix which have many applications in Engineering.
- To understand the basic theory of functions of a complex variable and conformal Transformations**.**

Syllabus

Analyticity of complex functions-Complex differentiation-Conformal mappings-Complex integration-System of linear equations-Eigen value problem

Expected outcome .

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

Text Book:

Erwin Kreyszig: Advanced Engineering Mathematics, 10th ed. Wiley

References:

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 **Series)**McGraw Hill Education India 2005
4.Complex variables introduction and applications-second edition-Mark.J.Owitz-Cambridge Publication

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	Complex differentiation Text 1[13.3,13.4] Limit, continuity and derivative of complex functions	3	
	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	15%
II	Conformal mapping: Text 1[17.1-17.4] Geometry of Analytic functions Conformal Mapping,	1	
	Mapping $w = z^2$ conformality of $w = e^z$.	2	15%

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

	Linear independence-rank of a matrix Vector Space-Dimension-basis-vector space$\mathbf{R^3}$ Solution of linear systems, Fundamental theorem of non-homogeneous linear systems(Without proof)-Homogeneous linear systems (Theory only	2 1	
VI	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%
END SEMESTER EXAM			

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

Prerequisite: Nil

Course objectives:

- To make the students capable of analyzing any linear time invariant electrical network.
- To study time domain, phasor and Laplace transform methods of linear circuit analysis.
- To study the transient response of networks subject to test signals.
- To develop understanding of the concept of resonance, coupled circuits and two port networks.

Syllabus:

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

Expected outcome:

At the end of the course students will be able to analyze the linear time invariant electrical circuits.

Text Books

1. Ravish R., Network Analysis and Synthesis, 2/e, McGraw-Hill, 2015.
2. Valkenburg V., Network Analysis, 3/e, PHI, 2011.

References:

1. Sudhakar A,S. P. Shyammohan, Circuits and Networks- Analysis and Synthesis, 5/e, McGraw-Hill, 2015.
2. Choudhary R., Networks and Systems, 2/e, New Age International, 2013.
3. Franklin F. Kuo, Network Analysis and Synthesis, 2/e, Wiley India, 2012.
4. Pandey S. K., Fundamentals of Network Analysis and Synthesis, 1/e, S. Chand, 2012.
5. Edminister, Electric Circuits – Schaum's Outline Series, McGraw-Hill,2009.

Course Plan

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	
FIRST INTERNAL EXAM			
III	Partial Fraction expansions for inverse Laplace transforms, Solution of differential equations using Laplace transforms	3	**15**
	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	
IV	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	**15**
	Time domain response from pole zero plot, Impulse Response	1	
	Network functions in the sinusoidal steady state, Magnitude and Phase response	3	
SECOND INTERNAL EXAM			
V	Parameters of two port network: impedance, admittance, transmission and hybrid parameters, Interrelationship among parameter sets	5	**20**
	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	
VI	Resonance: Series resonance, bandwidth, Q factor and Selectivity, Parallel resonance	3	**20**
	Coupled circuits: single tuned and double tuned circuits, dot convention, coefficient of coupling, Analysis of coupled circuits	4	
END SEMESTER EXAM			

Question Paper Pattern

The question paper consists 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. Each question can have a maximum of four subparts. Among the three questions one will be a compulsory question covering both the modules and the remaining two questions will be as one question from each module, of which one is 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

Prerequisite: Nil

Course objectives:

- To provide an insight into the basic semiconductor concepts
- To provide a sound understanding of current semiconductor devices and technology to appreciate its applications to electronics circuits and systems

Syllabus: 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

Expected outcome:

The students should have a good knowledge in semiconductor theory and electronic devices.

Text Books:

1. Ben G. Streetman and Sanjay Kumar Banerjee, Solid State Electronic Devices, Pearson, 6/e, 2010
2. Achuthan, K N Bhat, Fundamentals of Semiconductor Devices, 1e, McGraw Hill,2015

References:

1. Tyagi M.S., Introduction to Semiconductor Materials and Devices, Wiley India, 5/e, 2008
2. Sze S.M., Physics of Semiconductor Devices, John Wiley, 3/e, 2005
3. Neamen, Semiconductor Physics and Devices, McGraw Hill, 4/e, 2012
4. Pierret, Semiconductor Devices Fundamentals, Pearson, 2006
5. Rita John, Solid State Devices, McGraw-Hill, 2014
6. Bhattacharya .Sharma, Solid State Electronic Devices, Oxford University Press, 2012
7. Dasgupta and Dasgupta , Semiconductor Devices : Modelling and Technology (PHI)

Course Plan

Module	Course content (48hrs)	Hours	Sem. Exam Marks
I	Elemental and compound semiconductors, Fermi-Dirac distribution, Equilibrium and steady state conditions, Equilibrium concentration of electrons and holes, Temperature dependence of carrier concentration	4	15
	Carrier transport in semiconductors, drift, conductivity and mobility, variation of mobility with temperature and doping, High Field Effects, Hall effect	5	
II	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	15
FIRST INTERNAL EXAM			

III	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	**15**
IV	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	**15**
SECOND INTERNAL EXAM			
V	Bipolar junction transistor , current components, Minority carrier distributions, basic parameters, Evaluation of terminal currents (based on physical dimensions),Transistor action, Base width modulation	9	**20**
VI	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	**20**
	FinFET-structure and operation	1	
END SEMESTER EXAM			

Question Paper Pattern

The question paper consists 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. Each question can have a maximum of four subparts. Among the three questions one will be a compulsory question covering both the modules and the remaining two questions will be as one question from each module, of which one is 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

Prerequisite: Nil

Course objectives:

- To develop the skill of analysis and design of various analog circuits using discrete electronic devices as per the specifications.

Syllabus:

High pass and low pass RC circuits, Differentiator, Integrator, Analysis of BJT biasing circuits, small signal analysis of transistor configurations using small signal hybrid π 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

Expected outcome:

- At the end of the course, students will be able to analyse and design the different electronic circuits using discrete electronic components.

Text Books:

- Sedra A. S. and K. C. Smith, Microelectronic Circuits, 6/e, Oxford University Press, 2013
- Millman J. and C. Halkias, Integrated Electronics, 2/e, McGraw-Hill, 2010

References:

1. Neamen D., Electronic Circuits - Analysis and Design, 3/e, TMH, 2007
2. Rashid M. H., Microelectronic Circuits - Analysis and Design, Cengage Learning, 2/e, 2011
3. Spencer R. R. and M. S. Ghausi, Introduction to Electronic Circuit Design, Pearson, 2003
4. Razavi B., Fundamentals of Microelectronics, Wiley, 2015

Course Plan

Module	Course content (48 hrs)	Hours	Sem. Exam Marks
I	RC Circuits: Response of high pass and low pass RC circuits to sine, step, pulse and square wave inputs, Differentiator, Integrator	5	15
	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	
II	Small signal analysis of CE, CB and CC configurations using small signal hybrid π model (gain, input and output impedance). Small signal analysis of BJT amplifier circuits, Cascade amplifier	7	15
	FIRST INTERNAL EXAM		
III	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	15
	Wide band amplifier: Broad banding techniques, low frequency and high frequency compensation, Cascode amplifier.	4	
IV	Feedback amplifiers: Effect of positive and negative feedback on gain, frequency response and distortion, Feedback topologies and	3	15

	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	
SECOND INTERNAL EXAM			
V	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	**20**
	Switching Circuits: Simple sweep circuit, Bootstrap sweep circuit, Astable, Bistable, and Monostable multivibrators, Schmitt Trigger	5	
VI	Transistor based voltage regulator: Design and analysis of shunt and series voltage regulator, load and line regulation, Short circuit protection	4	**20**
	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, MOSFETCascade amplifier	5	
END SEMESTER EXAM			

Question Paper Pattern

The question paper consists 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. Each question can have a maximum of four subparts. Among the three questions one will be a compulsory question covering both the modules and the remaining two questions will be as one question from each module, of which one is 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

Prerequisite:Nil

Course objectives:

- To work with a positional number systems and numeric representations
- To introduce basic postulates of Boolean algebra and show the correlation between Boolean expression
- To outline the formal procedures for the analysis and design of combinational circuits and sequential circuits
- To study the fundamentals of HDL
- To design and implement combinational circuits using basic programmable blocks
- To design and implement synchronous sequential circuits

Syllabus:

Positional Number Systems, Boolean algebra, Combinational Logic, HDL concepts ,Digital ICs, Programmable Logic Devices, Sequential Logic, Sequential Circuits

Expected outcome:

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

Text Books:

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

References:

1.Ronald J Tocci, Digital Systems, Pearson Education, 11th edition,2010
2.Thomas L Floyd, Digital Fundamentals, Pearson Education, 8th edition 2009
3.Moris Mano, Digital Design, Prentice Hall of India, 3rd 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

Course Plan

Module	Course content (42 hrs)	Hours	Sem. Exam Marks
I	Number systems- decimal, binary, octal, hexa decimal, base conversion	2	15
	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	
II	Logic expressions, Boolean laws, Duality, De Morgan's law, Logic functions and gates	2	15
	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	
FIRST INTERNAL EXAM			
III	Introduction to HDL : Logic descriptions using HDL, basics of modeling (only for assignments)	**2**	**0**
	Logic families and its characteristics: Logic levels, propagation delay, fan in, fan out, noise immunity , power dissipation, TTL subfamilies	1	**15**
	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	
IV	Sequential circuits - latch, flip flop (SR, JK, T, D), master slave JK FF, conversion of FFs, excitation table and characteristic equations	3	**15**
	Asynchronous and synchronous counter design, mod N counters, random sequence generator	5	
SECOND INTERNAL EXAM			
V	Shift Registers - SIPO, SISO, PISO, PIPO, Shift registers with parallel LOAD/SHIFT Shift register counter - Ring Counter and Johnson Counter	3	**20**
	Mealy and Moore models, state machine ,notations, state diagram, state table, transition table, excitation table, state equations	3	
VI	Construction of state diagram – up down counter, sequence detector	3	**20**
	Synchronous sequential circuit design - State equivalence	2	
	State reduction – equivalence classes, implication chart	2	
END SEMESTER EXAM			

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

The question paper consists 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. Each question have a maximum of four subparts. Among the three questions one will be a compulsory question covering both the modules and the remaining two questions will be as one question from each module, of which one is to be answered. Mark pattern is according to the syllabus with maximum 50 % for theory, derivation, proof and 50% for logical/numerical problems.

Course No.	Course Name	L-T-P-Credits	Year of Introduction
HS210	LIFE SKILLS	2-0-2	2016

Course Objectives

- To develop communication competence in prospective engineers.
- To enable them to convey thoughts and ideas with clarity and focus.
- To develop report writing skills.
- To equip them to face interview & Group Discussion.
- To inculcate critical thinking process.
- To prepare them on problem solving skills.
- To provide symbolic, verbal, and graphical interpretations of statements in a problem description.
- To understand team dynamics & effectiveness.
- To create an awareness on Engineering Ethics and Human Values.
- To instill Moral and Social Values, Loyalty and also to learn to appreciate the rights of others.
- To learn leadership qualities and practice them.

Syllabus

Communication Skill: 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.

Critical Thinking & Problem Solving: Creativity, Lateral thinking, Critical thinking, Multiple Intelligence, Problem Solving, Six thinking hats Mind Mapping & Analytical Thinking.

Teamwork: Groups, Teams, Group Vs Teams, Team formation process, Stages of Group, Group Dynamics, Managing Team Performance & Team Conflicts.

Ethics, Moral & Professional Values: Human Values, Civic Rights, Engineering Ethics, Engineering as Social Experimentation, Environmental Ethics, Global Issues, Code of Ethics like ASME, ASCE, IEEE.

Leadership Skills: Leadership, Levels of Leadership, Making of a leader, Types of leadership, Transactions Vs Transformational Leadership, VUCA Leaders, DART Leadership, Leadership Grid & leadership Formulation.

Expected outcome

- Communicate effectively.
- Make effective presentations.
- Write different types of reports.
- Face interview & group discussion.
- Critically think on a particular problem.
- Solve problems.
- Work in Group & Teams
- Handle Engineering Ethics and Human Values.
- Become an effective leader.

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 T	P	Sem. Exam Marks
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, 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. **Technical Writing:** Differences between technical and literary style, Elements of style; Common Errors, **Letter Writing:** Formal, informal and demi-official letters; business letters, **Job Application**: Cover letter, Differences between bio-data, CV and Resume, **Report Writing:** Basics of Report Writing; Structure of a report; Types of reports. **Non-verbal Communication and Body Language:** Forms of non-verbal communication; Interpreting body-language cues; Kinesics; Proxemics; Chronemics; Effective use of body language **Interview Skills**: Types of Interviews; Ensuring success in job interviews; Appropriate use of non-verbal communication, **Group Discussion**: Differences between group discussion and debate; Ensuring success in group discussions, **Presentation Skills**: Oral presentation and public speaking skills; business presentations, **Technology-based Communication:** Netiquettes: effective e-mail messages; power-point presentation; enhancing editing skills using computer software.	2 3	2 4 4	
II	Need for Creativity in the 21st century, Imagination, Intuition, Experience, Sources of Creativity, Lateral Thinking, Myths of creativity	2		

	Critical thinking Vs Creative thinking, Functions of Left Brain & Right brain, Convergent & Divergent Thinking, Critical reading & Multiple Intelligence. Steps in problem solving, Problem Solving Techniques, Problem Solving through Six Thinking Hats, Mind Mapping, Forced Connections. Problem Solving strategies, Analytical Thinking and quantitative reasoning expressed in written form, Numeric, symbolic, and graphic reasoning, Solving application problems.	2	2 2	
III	Introduction to Groups and Teams, Team Composition, Managing Team Performance, Importance of Group, Stages of Group, Group Cycle, Group thinking, getting acquainted, Clarifying expectations. Group Problem Solving, Achieving Group Consensus. Group Dynamics techniques, Group vs Team, Team Dynamics, Teams for enhancing productivity, Building & Managing Successful Virtual Teams. Managing Team Performance & Managing Conflict in Teams. Working Together in Teams, Team Decision-Making, Team Culture & Power, Team Leader Development.	3 3	2 2	
IV	Morals, Values and Ethics, Integrity, Work Ethic, Service Learning, Civic Virtue, Respect for Others, Living Peacefully. Caring, Sharing, Honesty, Courage, Valuing Time, Cooperation, Commitment, Empathy, Self-Confidence, Character, 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. Engineering as experimentation, engineers as responsible experimenters, Codes of ethics, Balanced outlook on. The challenger case study, Multinational corporations, Environmental ethics, computer ethics, Weapons development, engineers as managers, consulting	3 3 3	2 2	

	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. 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. Leadership Styles, VUCA Leadership, DART Leadership, Transactional vs Transformational Leaders, Leadership Grid, Effective Leaders, making of a Leader, Formulate Leadership	4 2 2	 2 2	
END SEMESTER EXAM				

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 30th 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 31st working day and to be completed before 60th 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, auditability, 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) will be asked for the examination. 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
EC231	Electronic Devices & Circuits Lab	0-0-3-1	2016

Prerequisite: Should have registered for EC205 Electronic circuits

Course objectives:

- To study the working of analog electronic circuits.
- To design and implement analog circuits as per the specifications using discrete electronic components.

List of Experiments: (12 Mandatory Experiments)

1. VI Characteristics of rectifier and zener diodes
2. RC integrating and differentiating circuits (Transient analysis with different inputs and frequency response)
3. Clipping and clamping circuits (Transients and transfer characteristics)
4. Fullwave Rectifier -with and without filter- ripple factor and regulation
5. Simple Zener voltage regulator (load and line regulation)
6. Characteristics of BJT in CE configuration and evaluation of parameters
7. Characteristics of MOSFET in CS configuration and evaluation of parameters
8. RC coupled CE amplifier - frequency response characteristics
9. MOSFET amplifier (CS) - frequency response characteristics
10. Cascade amplifier – gain and frequency response
11. Cascode amplifier -frequency response
12. Feedback amplifiers (current series, voltage series) - gain and frequency response
13. Low frequency oscillators –RC phaseshift, Wien bridge,
14. High frequency oscillators –Colpitt's and Hartley
15. Power amplifiers (transformer less) - Class B and Class AB
16. Transistor series voltage regulator (load and line regulation)
17. Tuned amplifier - frequency response
18. Bootstrap sweep circuit
19. Multivibrators -Astable, Monostable and Bistable
20. Schmitt trigger

Expected outcome:

The student should able to:

1. Design and demonstrate functioning of various discrete analog circuits.
2. Function effectively as an individual and in a team to accomplish the given task.

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, CCVS, 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

	2. Obtain different types of plots (2D/3D, surface plot, polar plot) 3. Generate and plot various signals like sine square, pulse in same window. 4. Plot the diode/transistor characteristics. 5. Solve node, mesh and loop equations of simple electrical/network circuits. 6. Find the poles and zeros hence plot the transfer functions/polynomials 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. 8. Plot a full wave rectified waveform using Fourier series
3	**Introduction to HDL** [Institution can choose VHDL or Verilog as language to describe the problem and any one simulation/synthesis tool like Xilinix ISE, Modelsim, QSim, verilog, VHDL, EDwinXP or ORCAD etc. for the simulation.] **List of Experiments using HDL** Write the HDL code to realise and simulate the following circuits: (at least 4 of the following) 1. Basic gates/universal gates 2. Combinational Circuits (Half adder/Half subtractor) 3. Full adder in 3 modelling styles (Dataflow/structural/Behavioural) 4. Multiplexer/De-multiplexer 5. Decoder/Encoder 6. 4 bit adder/BCD adder 7. Flipflops (SR,JK,T,D) 8. Binary Counters 9. Finite state machines
Expected outcomes: 1. An ability to apply knowledge of computer, science, and engineering to the analysis of electrical and electronic engineering problems. 2. An ability to design systems which include hardware and software components. 3. An ability to identify, formulate and solve engineering problems. 4. An ability to use modern engineering techniques	

Course No.	Course Name	L-T-P - Credits	Year of Introduction
MA202	Probability distributions, Transforms and Numerical Methods	3-1-0-4	2016

Prerequisite: Nil

Course Objectives

- To introduce the concept of random variables, probability distributions, specific discrete and continuous distributions with practical application in various Engineering and social life situations.
- To know Laplace and Fourier transforms which has wide application in all Engineering courses.
- To enable the students to solve various engineering problems using numerical methods.

Syllabus

Discrete random variables and Discrete Probability Distribution.
Continuous Random variables and Continuous Probability Distribution.
Fourier transforms.
Laplace Transforms.
Numerical methods-solution of Algebraic and transcendental Equations, Interpolation.
Numerical solution of system of Equations. Numerical Integration, Numerical solution of ordinary differential equation of First order.

Expected outcome .

After the completion of the course student is expected to have concept of
(i) Discrete and continuous probability density functions and special probability distributions.
(ii) Laplace and Fourier transforms and apply them in their Engineering branch
(iii) numerical methods and their applications in solving Engineering problems.

Text Books:

1. Miller and Freund's "Probability and statistics for Engineers"-Pearson-Eighth Edition.
2. Erwin Kreyszig, "Advanced Engineering Mathematics", 10th edition, Wiley, 2015.

References:

1. V. Sundarapandian, "Probability, Statistics and Queuing theory", PHI Learning, 2009.
2. C. Ray Wylie and Louis C. Barrett, "Advanced Engineering Mathematics"-Sixth Edition.
3. Jay L. Devore, "Probability and Statistics for Engineering and Science"-Eight Edition.
4. Steven C. Chapra and Raymond P. Canale, "Numerical Methods for Engineers"-Sixth Edition-Mc Graw Hill.

Course Plan

Module	Contents	Hours	Sem. Exam Marks
I	**Discrete Probability Distributions.** (Relevant topics in section 4.1,4,2,4.4,4.6 Text1)		
	Discrete Random Variables, Probability distribution function, Cumulative distribution function.	2	
	Mean and Variance of Discrete Probability Distribution.	2	
	Binomial Distribution-Mean and variance.	2	
	Poisson Approximation to the Binomial Distribution. Poisson distribution-Mean and variance.	2	15%

II	**Continuous Probability Distributions.** (Relevant topics in section 5.1,5.2,5.5,5.7 Text1) Continuous Random Variable, Probability density function, Cumulative density function, Mean and variance. Normal Distribution, Mean and variance (without proof). Uniform Distribution.Mean and variance. Exponential Distribution, Mean and variance.	 2 4 2 2	15%
FIRST INTERNAL EXAMINATION			
III	**Fourier Integrals and transforms. (**Relevant topics in section 11.7, 11.8, 11.9 Text2) Fourier Integrals. Fourier integral theorem (without proof). Fourier Transform and inverse transform. Fourier Sine & Cosine Transform, inverse transform.	 3 3 3	15%
IV	**Laplace transforms. (**Relevant topics in section 6.1,6.2,6.3,6.5,6.6 Text2**)** Laplace Transforms, linearity, first shifting Theorem. Transform of derivative and Integral, Inverse Laplace transform, Solution of ordinary differential equation using Laplace transform. Unit step function, second shifting theorem. Convolution Theorem (without proof). Differentiation and Integration of transforms.	 3 4 2 2 2	15%
SECOND INTERNAL EXAMINATION			
V	**Numerical Techniques**.(Relevant topics in section.19.1,19.2,19.3 Text2) Solution Of equations by Iteration, Newton- Raphson Method. Interpolation of Unequal intervals-Lagrange's Interpolation formula. Interpolation of Equal intervals-Newton's forward difference formula, Newton's Backward difference formula.	 2 2 3	20%
VI	**Numerical Techniques**. (Relevant topics in section 19.5,20.1,20.3, 21.1 Text2) Solution to linear System- Gauss Elimination, Gauss Seidal Iteration Method. Numeric Integration-Trapezoidal Rule, Simpson's 1/3 Rule. Numerical solution of firstorder ODE-Euler method, Runge-Kutta Method (fourth order).	 3 3 3	20%
END SEMESTER EXAM			

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
EC202	SIGNALS & SYSTEMS	3-1-0-4	2016

Prerequisite: Nil

Course objectives:

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.
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.
3. To familiarize with techniques suitable for analyzing and synthesizing both continuous-time and discrete time systems.
4. To gain knowledge of time-domain representation and analysis concepts as they relate to differential equations, difference equations, impulse response and convolution, etc.
5. To study frequency-domain representation and analysis concepts using Fourier analysis tools, Laplace Transform and Z-transform.
6. To study concepts of the sampling process, reconstruction of signals and interpolation.

Syllabus:

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 transform, unilateral Laplace Transform, transfer function, Frequency response, sampling , aliasing, Z transform ,Inverse 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 all transforms

Expected outcome:

1.Define, represent, classify and characterize basic properties of continuous and discrete time signals and systems.
2.Represent the CT signals in Fourier series and interpret the properties of Fourier transform, Laplace transform
3.Outline the relation between convolutions, correlation and to describe the orthoganality of signals.
4.Illustrate the concept of transfer function and determine the Magnitude and phase response of systems.
5.Explain sampling theorem and techniques for sampling and reconstruction.
6.Determine z transforms, inverse z transforms signals and analyze systems using z transforms.

Text Books:

1. Alan V. Oppenheim and Alan Willsky, Signals and Systems, PHI, 2/e, 2009
2. Simon Haykin Signals & Systems, John Wiley, 2/e, 2003

References:

1. Anand Kumar, Signals and Systems, PHI, 3/e, 2013.
2. Mahmood Nahvi, Signals and System, Mc Graw Hill (India), 2015.
3. P Ramakrishna Rao, Shankar Prakriya, Signals and System, MC Graw Hill Edn 2013.
4. B P. Lathi, Priciples of Signal Processing & Linear systems, Oxford University Press.
5. Gurung, Signals and System , PHI.
6. Rodger E. Ziemer Signals & Systems - Continuous and Discrete, Pearson, 4/e, 2013

Course Plan			
Module	**Course content (48 hrs)**	**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, orthoganality of signals.	2	
FIRST INTERNAL EXAM			
III	Frequency Domain Representation of Continuous Time Signals- Continuous Time Fourier Series and its properties.	3	**15**
	Convergence,Continuous Time Fourier Transform: Properties.	2	
	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.	3	**15**
	Sampling of continuous time signals, Sampling theorem for lowpass signals, aliasing.	3	
SECOND INTERNAL EXAM			
V	Z transform, ROC , Inverse transform, properties, unilateral Z transform.	3	**20**
	Frequency Domain Representation of Discrete Time Signals, Discrete Time Fourier Series and its properties.	3	
	Discrete Time Fourier Transform (DTFT) and its properties	3	
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

The question paper consists 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. Each question can have a maximum of four subparts. Among the three questions one will be a compulsory question covering both the modules and the remaining two questions will be as one question from each module, of which one is 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
EC204	Analog Integrated Circuits	4-0-0-4	2016

Prerequisite: Nil

Course objectives:

- To equip the students with a sound understanding of fundamental concepts of operational amplifiers
- To know the diversity of operations that op amp can perform in a wide range of applications
- To introduce a few special functions integrated circuits.
- To impart basic concepts and types of data converters

Syllabus: 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 IC and their application, Monolithic Voltage Regulators types and its Applications, Data Converters, specifications and types

Expected outcome:

- On completion of this course, the students will have a thorough understanding of operational amplifiers
- Students will be able to design circuits using operational amplifiers for various applications

Text Books:

1. Salivahanan S. ,V. S. K. Bhaaskaran, Linear Integrated Circuits, Tata McGraw Hill, 2008
2. Franco S., Design with Operational Amplifiers and Analog Integrated Circuits, 3/e, Tata McGraw Hill, 2008

References:

1. David A. Bell, Operational Amplifiers & Linear ICs, Oxford University Press, 2nd edition, 2010.
2. Gayakwad R. A., Op-Amps and Linear Integrated Circuits, Prentice Hall, 4/e, 2010.
3. R.F. Coughlin & Fredrick Driscoll, Operational Amplifiers & Linear Integrated Circuits, 6th Edition, PHI,2001
4. C.G. Clayton, Operational Amplifiers, Butterworth & Company Publ. Ltd./ Elsevier, 1971.
5. Roy D. C. and S. B. Jain, Linear Integrated Circuits, New Age International, 3/e, 2010.
6. Botkar K. R., Integrated Circuits, 10/e, Khanna Publishers, 2010.

Course Plan

Module	Course content (54hrs)	Hours	Sem. Exam Marks
I	Differential amplifiers: Differential amplifier configurations using BJT, Large and small signal operations, Balanced and unbalanced output differential amplifiers, 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, multistage differential amplifiers.	6	15
	Operational amplifiers: Introduction, Block diagram, Ideal op-	5	

	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		
II	Op-amp with negative feedback: Introduction, feedback configurations, voltage series feedback, voltage shunt feedback, properties of Practical op-amp.	3	**15**
	Op-amp applications: Inverting and non inverting amplifier, dc and ac amplifiers, peaking amplifier, summing, scaling and averaging amplifiers, instrumentation amplifier.	4	
FIRST INTERNAL EXAM			
III	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	6	**15**
IV	Square, triangular and saw tooth wave generators, Comparators, zero crossing detector, Schmitt trigger, characteristics and limitations.	4	**15**
	Active filters, First and Second order Butterworth filter and its frequency response for LPF, HPF, BPF, BSF, and Notch filter.	5	
SECOND INTERNAL EXAM			
V	Specialized IC's and its applications: Timer IC 555 (monostable & astable operation), Voltage controlled oscillator, Analog Multiplier	4	**20**
	PLL, operating principles, Applications: frequency multiplication/division, Frequency synthesizer, AM & FM detection , FM modulator/Demodulator	4	
	Monolithic Voltage Regulators: Three terminal voltage regulators 78XX and 79XX series, IC723 , low voltage and high voltage regulator, Current boosting, short circuit and fold back protection.	4	
VI	Data Converters: D/A converter , specifications , weighted resistor type, R-2R Ladder type, switches for D/A converters, high speed sample-and-hold circuits	4	**20**
	A/D Converters: Specifications, Flash type, Counter ramp type, Successive Approximation type, Single Slope type, Dual Slope type	4	
END SEMESTER EXAM			

Question Paper Pattern

The question paper consists 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. Each question can have a maximum of four subparts. Among the three questions one will be a compulsory question covering both the modules and the remaining two questions will be as one question from each module, of which one is 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
EC206	Computer Organisation	3-0-0-3	2016

Prerequisite: EC207 Logic circuit design

Course objectives:

- To impart knowledge in different aspects of processor design.
- To develop understanding about processor architecture.
- To impart knowledge in programming concepts.
- To develop understanding on I/O accessing techniques and memory structures.

Syllabus:

Functional units of a computer, Arithmetic Circuits, Processor architecture, Instructions and addressing modes, Execution of program, micro architecture design process, design or data path and control units, I/O accessing techniques, Memory concepts, memory interface, cash and virtual memory concepts

Expected outcome:

The student should be able to:

- Illustrate the structure of a computer
- Categorize different types of memories
- Explain various techniques in computer design.

Text Books:

1. David Money Harris, Sarah L Harris, Digital Design and Computer Architecture, Morgan Kaufmann – Elsevier, 2009

References:

1. William Stallings: "Computer Organisation and Architecture", Pearson Education.
2. John P Hayes: "Computer Architecture and Organisation", Mc Graw Hill.
3. Andrew S Tanenbaum: "Structured Computer Organisation", Pearson Education.
4. Craig Zacker: "PC Hardware : The Complete Reference", TMH.
5. Carl Hamacher : "Computer Organization ", Fifth Edition, Mc Graw Hill.
6. David A. Patterson and John L. Hennessey, "Computer Organisation and Design", Fourth Edition, Morgan Kaufmann.

Course Plan

Module	Course content (42 hrs)	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- Fixed Point & Floating Point	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	
FIRST INTERNAL EXAM			

III	Addressing Modes – register only, immediate, base, PC-relative, Pseudo – direct	3	**15**
	Steps for Executing a Program – Compilation, Assembling, Linking, Loading	3	
	Pseudoinstuctions, Exceptions, Signed and Unsigned Instructions, Floating Point Instructions	3	
IV	Microarchitecture- design process	2	**15**
	Single cycle processor, Single cycle data path, single cycle control	2	
	multi cycle processor, multi cycle data path, multi cycle control	3	
SECOND INTERNAL EXAM			
V	Memory & I/O systems – I/O accessing techniques: programmed, interrupt driven and DMA, DMA bus arbitration	3	**20**
	Memory Arrays – Bit Cells, Organization, Memory Ports Memory types- DRAM, SRAM, Register Files, ROM	3	
VI	Memory - Hierarchy, Performance analysis	1	**20**
	Cache Memory – direct mapped, multi way set associate cache, Fully associate cache	3	
	Virtual Memory – Address Translation, Page Table, Translation Look aside Buffer, Memory Protection, replacement polices	3	
END SEMESTER EXAM			

Question Paper Pattern

The question paper consists 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. Each question can have a maximum of four subparts. Among the three questions one will be a compulsory question covering both the modules and the remaining two questions will be as one question from each module, of which one is to be answered. Mark pattern is according to the syllabus with maximum 50 % for theory and 50% for logical/numerical problems, derivation and proof.

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC208	ANALOG COMMUNICATION ENGINEERING	3-0-0-3	2016

Prerequisite: EC205 Electronic circuits

Course objectives:

- To study the concepts and types of modulation schemes.
- To study different types of radio transmitters and receivers.
- To study the effects of noise in analog communication systems

Syllabus:

Elements of communication system, Need for modulation, amplitude Modulation, amplitude modulator circuit, demodulator circuit, AM transmitters, Types of AM, AM Receiver, Angle modulation: principles of frequency modulation, phase modulation, frequency modulator circuits, FM transmitters, FM receiver, Noise in communication system, Effect of noise in Analog Communication Systems, Telephone systems, standard telephone set, cordless telephones .

Expected outcome:

- Student will understand the fundamentals ideas of noises and its effect in communication system.
- Students can explain the principle and working of AM, FM, and PM system and transmitters and receivers.
- Students will be able to know the basic ideas of PSTN and advanced line communication systems.

Text Books:

1. Simon Haykin, Communication Systems, Wiley 4/e, 2006.
2. Tomasi, Electronic Communications System, Pearson, 5/e,2011.

References:

3. Dennis Roody and John Coolen, Electronic Communication, Pearson, 4/e, 2011.
4. Tomasi,Advanced Electronic Communications Systems, Pearson, **6/e**, 2012.
5. Taub ,Schilling, Saha,Principles of communication system,McGraw Hill,2013.
6. George Kennedy, ElectronicCommunication Systems, McGrawHill, 4/e, 2008.
7. Blake, Electronic Communication system, Cengage, 2/e , 2012.

Course Plan

Module	Course content (42 hrs)	Hours	Sem. Exam Marks
I	Introduction, elements of communication system, time and frequency domains, Need for modulation	2	15
	Noise in communication system, shot noise, thermal noise, white noise, partition noise, flicker noise, burst noise, signal to noise ratio, noise figure, noise temperature, narrow band noise, representation in terms of in-phase and quadrature components, envelope and phase components, sine wave plus narrow band noise.	5	
II	Amplitude modulation: Sinusoidal AM modulation index, Average power, Effective voltage and current, Nonsinusoidal modulation	4	
	Amplitude modulator circuits, Amplitude demodulator circuit,	3	

	AM transmitters		
FIRST INTERNAL EXAM			
III	AM Receiver, super heterodyne receiver, detector, tuning range, tracking, sensitivity and gain, Image rejection, double conversion, adjacent channel rejection, Automatic Gain Control (AGC).	4	**15**
	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.	5	
IV	Angle modulation: Frequency modulation, Sinusoidal FM, Frequency spectrum, modulation index ,average power, Non-sinusoidal modulation, deviation ratio, comparison of AM and FM	3	**15**
	Phase modulation, Equivalence between PM and FM, Sinusoidal Phase Modulation, Digital Phase Modulation.	3	
SECOND INTERNAL EXAM			
	Angle modulator Circuits : Varactor Diode Modulators, Transistors Modulators, FM Transmitters: Direct & Indirect Methods.	2	
V	FM receiver, slope detector, balanced slope detector, Foster-Seeley discriminator, Ratio Detector, Quadrature detector, PLL demodulator, Automatic Frequency Control, Amplitude limiters, Pre-emphasis and De-emphasis,	3	**20**
	Effect of noise in analog communication Systems- AM Systems, DSBSC AM, SSB AM, Angle modulation, Threshold Effect in Angle modulation.	4	
VI	Telephone systems, standard telephone set, basic call procedures and tones, DTMF, cordless telephones.	4	
END SEMESTER EXAM			

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 office Exchanges, Automated central office switches and Exchanges.**

Question Paper Pattern

The question paper consists 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. Each question can have a maximum of four subparts. Among the three questions one will be a compulsory question covering both the modules and the remaining two questions will be as one question from each module, of which one is 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 Number	Course Name	L-T-P	Credits	Year of introduction
HS200	Business Economics	3-0-0	3	2016

Course Objectives

- To familiarize the prospective engineers with elementary Principles of Economics and Managerial Economics;.
- To acquaint the students with tools and techniques that are useful in their profession in Managerial Decision Making which will enhance their employability;
- To gain understanding of some Macroeconomic concepts to improve their ability to understand the business climate;
- To prepare and understand balance sheet at an elementary level.

Syllabus

Nature of economics. Demand and Supply Analysis, demand curve, supply curve and equilibrium price determination. Production economics, economies of Scale, optimal quantity determination, Production and Cost functions, the law of Diminishing Marginal Productivity, Costs, Break-Even Analysis Chart Preparation and Cost-Volume-Profit Analysis. Market Structure and Price-Output Decisions under various competition situations and Collusion/Cartel formations in the real life situation. Monetary theory, functions of RBI and NI. Computation and some aspects of macro economics. Capital Budgeting decisions, forecasting techniques and elementary Balance Sheet..

Expected Outcome

A student who has undergone this course

- *would be able to make investment decisions based on capital budgeting methods in alignment with microeconomic and macroeconomic theories.*
- *would be 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.*
- *would gain knowledge on Monetary theory, measures by RBI in controlling interest rate and emerging concepts like Bit Coin.*
- *would gain knowledge of elementary accounting concepts used for preparing balance sheet and interpretation of balance sheet*

Course Plan			
Unit	**Topics**	**Hours Allotted**	**Percentage Marks**
I	**Nature of Economics** Definitions of Economics and their limitations, Economic Problems (2 Hrs.), Economic Systems, meaning of Business or Managerial Economics (2 Hrs.)and its role and relevance in managerial decision making in an industrial setting (2 Hrs).	6	15%
II	**Demand and Supply Analysis** Demand Curve, Demand function (2 Hrs.), Elasticity of demand and its estimation (2 Hrs.), Supply curve, equilibrium price and price mechanism (2 Hrs).	6	15%
FIRST INTERNAL EXAM			
III	**Production Economics** Economies of Scale and Diseconomies of Scale (1 Hr.), Production and Cost Functions. Factors of Production (2 Hrs.), Law of Diminishing marginal Productivity. Construction and analysis of Break Even Charts (3 Hrs.)	6	15%
IV	**Market Structure and Price-Output Decisions** Price and output determination under Perfect Competition, Monopoly and Monopolistic Competition (3 Hrs.). Collusion and Cartel, Nash Equilibrium (3 Hrs.).	6	15%
SECOND INTERNAL EXAM			
V	**Money, National Income and Taxation** Money, Emerging Bit Coin concept, Quantity Theory of Money, Interest Rate Management (2 Hrs), Open Market Operations by RBI, Selective Credit Controls, SLR, CRR (2 Hrs), Definition & Measurement of National Income, methods, sectors of economy (3 Hrs), inflation, deflation, trade cycles- Value-Added Tax (2 Hrs).	9	20%
VI	**Investment Decisions and Balance Sheet Analysis** Capital Budgeting, Investment Analysis – NPV, IRR, Profitability Index, ARR, Payback Period (3 Hrs), Depreciation, Time value of money. Business Forecasting– Elementary techniques (2 Hrs). Balance sheet preparation principles and interpretation (4 Hrs)	9	20%
END SEMESTER EXAM			

Text Book

Yogesh, Maheswari, *Management Economics* , PHI learning, NewDelhi, 2012

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, 6th edition, Wiley
4. Snyder C and Nicholson W, Fundamentals of Microeconomics, Cengage Learning (India), 2010.
5. Truett, Managerial Economics: Analysis, Problems, Cases, 8th Edition, Wiley Welch, Economics: Theory and Practice 7th Edition, Wiley

COURSE CODE	COURSE NAME	L-T-P-C	YEAR OF INTRODUCTION
EC232	ANALOG INTEGRATED CIRCUITS LAB	0-0-3-1	2016

Prerequisite:.Should have registered for EC204 Analog Integrated Circuits

Course objectives:

- To acquire skills in designing and testing analog integrated circuits
- To expose the students to a variety of practical circuits using various analog ICs.

List of Experiments: (Minimum 12 experiments are to be done)

1. Familiarization of Operational amplifiers - Inverting and Non inverting amplifiers, frequency response, Adder, Integrator, comparators.
2. Measurement of Op-Amp parameters.
3. Difference Amplifier and Instrumentation amplifier.
4. Schmitt trigger circuit using Op –Amps.
5. Astable and Monostable multivibrator using Op -Amps.
6. Timer IC NE555
7. Triangular and square wave generators using Op- Amps.
8. Wien bridge oscillator using Op-Amp - without & with amplitude stabilization.
9. RC Phase shift Oscillator.
10. Precision rectifiers using Op-Amp.
11. Active second order filters using Op-Amp (LPF, HPF, BPF and BSF).
12. Notch filters to eliminate the 50Hz power line frequency.
13. IC voltage regulators.
14. A/D converters- counter ramp and flash type.
15. D/A Converters- ladder circuit.
16. Study of PLL IC: free running frequency lock range capture range

Expected outcome:

The student should able to:

1. Design and demonstrate functioning of various analog circuits
2. Students will be able to analyze and design various applications of analog circuits.

Course code	Course Name	L-T-P - Credits	Year of Introduction
EC234	Linear Integrated Circuits and Digital Electronics Laboratory	0-0-3--1	2016

Prerequisite: EC212 Linear integrated circuits and digital electronics

Course Objectives

- To study various digital and linear integrated circuits used in simple system configuration

List of Exercises/Experiments : (10 experiments are mandatory)

1. Operational Amplifiers (IC741)-Characteristics
2. Square , triangular and ramp generation using op-amps
3. Log and Antilog amplifiers.
5. Astable and monostable multivibrators using op-amps
6. Active notch filter realization using op-amps
7. Wein bridges oscillator using OpAmp
8. OpAmp Integrator and Differentiator.
9. Code converter - Binary to gray and Gray to binary.
10. Adder and Subtractor Circuits using logic IC
11. Implementation of combinational logic circuits using MUX IC
12. Design and implementation of multiplexer and demultiplexer.
13. 3-bit synchronous counter design
14. Asynchronous counter design and Mod-n counter
15. Shift registers - SISO/SIPO & PISO/PIPO
16. Ring and Johnson Counters

List of major equipment

CRO, Function generator , Single power supply , Dual power supply, Digital multimeter, Ammeter ,Voltmeter.

Expected outcome .

On completion ,the students will be able to

1. Design simple circuits like amplifiers using OP-AMPs.
2. Design waveform Generating circuits.
3. Understand Digital concepts
4. Logically explain the concepts of combinational and sequential circuits.

Text Book:

1.RamakantA.Gayakward, Op-amps and Linear Integrated Circuits, IV edition, Pearson Education, 2003 / PHI.
2. D.RoyChoudhary, SheilB.Jani, Linear Integrated Circuits, II edition, New Age, 2003.
3. M. Morris Mano, Digital Logic and Computer Design, Prentice Hall of India, 2002