KANNUR UNIVERSITY
FACULTY OF ENGINEERING

Curricula, Scheme of Examinations & Syllabi for B.Tech Degree Programme (III-IV Semesters) in ELECTRONICS AND COMMUNICATION ENGINEERING With effect from 2007 Admissions

THIRD SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
2K6EC 301	Engineering Mathematics II	3	1	-	50	3	100
2K6EC 302	Humanities	3	1	-	50	3	100
2K6EC 303	Electrical Engineering	3	1	-	50	3	100
2K6EC 304	Solid State Devices	3	1	-	50	3	100
2K6EC 305	Network Theory	3	1	-	50	3	100
2K6EC 306	Electronic Circuits I	3	1	-	50	3	100
2K6EC 307(P)	**Basic Electronics Lab**	-	-	3	50	3	100
2K6EC 308(P)	**Electrical Engineering Lab**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

FOURTH SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
2K6EC 401	Engineering Mathematics III	3	1	-	50	3	100
2K6EC 402	Computer Programming	3	1	-	50	3	100
2K6EC 403	Communication Engineering I	3	1	-	50	3	100
2K6EC 404	Signals & Systems	3	1	-	50	3	100
2K6EC 405	Electronic Circuits II	3	1	-	50	3	100
2K6EC 406	Digital Electronics	3	1	-	50	3	100
2K6EC 407(P)	**Electronic Circuits Lab**	-	-	3	50	3	100
2K6EC 408(P)	**Digital Electronics Lab**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

2K6 EC 301 : ENGINEERING MATHEMATICS II

3 hours lecture and 1 hour tutorial per week

Module I:

Infinite Series: Convergence and divergence of infinite series – Ratio test – Comparison test – Raabe's test – Root test – Series of positive and negative terms- absolute convergence – Test for alternating series. ***Power Series***: Interval of convergence – Taylors and Maclaurins series representation of functions – Leibnitz formula for the derivative of the product of two functions – use of Leibnitz formula in the Taylor and Maclaurin expansions

Module II:

Matrices: Concept of rank of a matrix –echelon and normal forms – System of linear equation - consistency – Gauss elimination– Homogeneous liner equations-Fundamental system of solutions- Inverse of a matrix – solution of a system of equations using matrix inversion – eigen values and eigen vectors - Cayley- Hamilton Theorem.

Module III:

Vector Integral Calculus: Evaluation of line integral, surface integral and volume integrals – Line integrals independent of the path, conservative force fields, scalar potential- Green's theorem- Gauss' divergence theorem- Stoke's theorem (proof of these not required).

Module IV:

Vector Spaces: subspaces–linear dependence and independence–bases and dimension-linear transformations -sums, products and inverse of linear transformations.

References:

1. Kreyszing E. Advanced Engineering Mathematics, Wiley Eastern
2. Sastri. S. S. Engineering Mathematics, Prentice Hall of India.
3. Wylie .C. R. Advanced Engineering Mathematics, Mc Grawhill.
4. B .S. Grewal. Higher Engineering Mathematics, Khanna Publishers.
5. Greenberg. M.D. Advanced Engineering Mathematics, Pearson Education Asia.
6. Narayanan .S. Manickavachagom Pella and Ramaiah. Advanced Mathematics for Engineering Students, S. Viswanathan Publishers

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6EC 302 : HUMANITIES

3 hours lecture and 1 hour tutorial per week

Module I (20 hours)

Functional English Grammar: Sentence Analysis -Basic Patterns -Noun Group, Verbal Group, and Adverbial Group- Tenses – Conditionals - Active and Passive Voice - Reported Speech

Module II (14 hours)

Technical Communication

1. Nature, Growing need, and importance of technical communication – technical communication skills – listening, speaking, reading, and writing.
2. Barriers to effective communication – improper encoding, bypassing inter- cultural differences etc.
3. Organization in technical communication – spatial, chronological etc.
4. Style in technical communication - objectivity, accuracy, brevity, clarity etc.
5. Technical reports – types and format

Professional Ethics: 1. Ethics in Engineering, copyright – IPR- patents

Module III (10 hours)

Humanities, Science and Technology

1. Importance of humanities to technology, Education and Society
2. Relevance of a scientific temper
3. Relation between science, society and culture – the views of modern thinkers
4. The development of science and technology in society – science and technology in ancient Greece and India – the contribution of the Arabs to science and technology – recent advances in Indian science.

Reference books

1. Huddleston R, English Grammar – An outline, Cambridge University Press
2. Pennyor, Grammar Practice Activities, Cambridge University Press
3. Murphy, Intermediate English Grammar, Cambridge University Press
4. Hashemi, Intermediate English Grammar, Supplementary Exercises with answers, Cambridge University Press
5. Vesilind; Engineering, Ethics and the Environment, Cambridge University Press
6. Larson E; History of Inventions, Thompson Press India Ltd.
7. Bernal J. D., Science in History, Penguin Books Ltd.
8. Dampier W. C., History of Science, Cambridge University Press
9. Encyclopedia Britannica, History of Science, History of Technology
10. Subrayappa; History of Science in India, National Academy of Science, India
11. Brownoski J, Science and Human Values, Harper and Row
12. Schrödinger, Nature and Greeks and Science and Humanism, Cambridge University Press
13. Bossel. H., Earth at a Crossroads – paths to a sustainable future, Cambridge University Press
14. McCarthy, English Vocabulary in Use, Cambridge University Press
15. M. Ashraf Rizvi, Effective Technical Communication, Tata McGraw Hill, New Delhi, 2005

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 10 short type questions of 2 marks, from Module 1

Q II - 10 questions of 5 marks, from module II and III for writing short notes with choice to answer any **seven**

Q III - 2 questions A and B of 15 marks from module I for writing essay with choice to answer any one

Q IV - 2 questions A and B of 15 marks from module II for writing essay with choice to answer any one

Q V - 2 questions A and B of 15 marks from module III for writing essay with choice to answer any one

2K6 EC 303 : ELECTRICAL ENGINEERING

3 hours lecture and 1 hour tutorial per week

MODULE - I

DC Generator – E.M.F equation- Armature reaction – Commutation - interlopes – power flow diagram – losses and efficiency – voltage regulation – parallel operation – load sharing

DC Motor- back E.M.F. – speed equation – torques – performance characteristics – power flow diagram- losses and efficiency – starter- two point and three point – swinburns test – thyristor control of series and shunt motor.

MODULE –II

Transformers- E.M.F. equation- equivalent circuit- losses and efficiency –all day efficiency- voltage regulation – phasor diagrams – OC and SC test- auto transformer- saving of copper – applications- CT and PT – applications

Parallel operations of single phase and three phase transformers- three phase transformer connections- star to star- star to delta- delta to delta-applications

MODULE –III

Alternators- E.M.F. equation-effects of harmonics on pitch factor and distribution factor- voltage regulation- mmf and emf method- parallel operation – synchronization

Synchronous motor- starting method- power developed by synchronous motor- applications- synchronous condenser

MMODULE – IV

Three phase Induction motor- types – torque equations- torque slip and torque speed characteristics- power flow diagram – efficiency – equivalent circuit- induction generator

Special machines – single phase FHP motor starting methods- double field revolving theory-types and applications – stepper motor –classifications and applications – servomotors – classifications and applications –shaded pole motors -applications

Text book

1. Hughes E., Electrical Technology, ELBS

Reference books

1. Cotton H., Electrical Technology Pitman
2. Golding, Electrical measurements and measuring instruments, ELBS

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any on

2K6 EC 304 : SOLID STATE DEVICES

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

Energy bands and charge carriers in semiconductors - Direct and indirect band gap semiconductors - Concept of effective mass - Intrinsic and extrinsic semiconductors - Fermi level - Electron and hole concentrations at equilibrium - Temperature dependence of carrier concentrations - Conductivity and mobility - Quasi Fermi level - Diffusion and drift of carriers - Einstein relation - Continuity equation

Module II (13 hours)

PN junctions - Contact potential - Space charge at a junction - Current flow at a junction - Carrier injection - Diode equation - Minority and majority carrier currents - Capacitance of pn junctions - Reverse bias breakdown - Zener and avalanche breakdown - Abrupt and graded junctions - Schottky barrier - Rectifying and ohmic contacts - Tunnel diode - Varactor diode - Zener diode

Module III (13 hours)

Charge transport in a bipolar junction transistor - Current and voltage amplification - Concept of load line - Analysis of transistor currents - Ebers-Moll model - Early effect - Concept of Early voltage - Avalanche breakdown in transistors - Transit time effects - Hetero junction GaAs BJTs

Module IV (13 hours)

Junction FET - Pinch off and saturation - Gate control - VI characteristics - MOS capacitor - Accumulation, depletion and strong inversion - threshold voltage - MOSFET - p channel and n channel MOSFETs - Depletion and Enhancement mode MOSFETs - Substrate bias effects - Floating gate MOSFETs - Short channel effects - hot carrier effect – MESFET- CMOS inverter-characteristics

Text books

1. Streetman B.G., *Solid State Electronic Devices*, Prentice Hall of India
2. Sze S.M., *Physics of Semiconductor Devices*, Wiley Eastern
3. Michael A.Shur, *Physics of Semiconductor Devices*, Prentice Hall of India

Reference books

1. Millman & Halkias, Integrated Electronics, McGraw Hill
2. Baker R.J., Li H.W. & Boyce D.E., CMOS - Circuit Design, Layout and Simulation, Prentice Hall of India
3. Kwok K N., Complete Guide to Semiconductor Devices, McGraw Hill
4. Yang E.S., Microelectronics Devices, McGraw Hill

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 EC 305: NETWORK THEORY

3 hours lecture and 1 hour tutorial per week

Module I (10 hours)

Circuit elements and sources - Dependent and independent sources - Network theorems - Review of Thevenin's & Norton's theorem - Superposition theorem - Maximum power transfer theorem - First and second order circuits - Zero state response - Zero input response-Complete Response-Step Response and Impulse response of first and second order circuits

Module II (13 hours)

S-Domain Analysis of Circuits - Review of Laplace transform - Convolution theorem and convolution integral - Transformation of a circuit into S-domain - Transformed equivalent of inductance, capacitance and mutual inductance - Impedance and admittance in the transform domain - Node analysis and mesh analysis of the transformed circuit - Nodal admittance Matrix- mutually coupled circuits - Input and transfer immittance functions - Transfer functions - Impulse response and Transfer function - Poles and Zeros - Pole Zero plots - Sinusoidal steady state from Laplace transform inversion - Frequency response by transform evaluation on j-axis - Frequency response from pole-zero plot by geometrical interpretation

Module III (16 hours)

Two port networks: Two port networks - Characterization in terms of impedance - Admittance - Hybrid and transmission parameters - Inter relationships among parameter sets - Reciprocity Theorem - Interconnection of two port networks - Series, parallel and cascade - Network functions - Pole zero plots and steady response from pole - zero plots

Symmetrical two port networks: T and π Equivalent of a two port network - Image impedance - Characteristic impedance and propagation constant of a symmetrical two port network - Properties of a symmetrical two port network

Symmetrical Two Port Reactive Filters: Filter fundamentals - Pass and stop bands - Behavior of iterative impedance - Constant - k low pass filter - Constant - k high pass filter-m-derived T and π sections and their applications for infinite attenuation and filter terminations - Band pass and band elimination filters

Module IV (13 hours)

Synthesis: Positive real functions - Driving point functions - Brune's positive real functions - Properties of positive real functions - Testing driving point functions - Application of maximum module theorems - Properties of Hurwitz polynomials - Even and odd functions - Strum's theorem - Driving point synthesis - RC elementary synthesis operations - LC network synthesis - Properties of RC network functions - Foster and Cauer forms of RC and RL networks

Text books

1. Gupta B.R. & Singhal V., Fundamentals of Electrical Networks, Wheeler Pub
2. Van Valkenberg M.E., Introduction to Modern Network Synthesis, Wiley Eastern
3. Van Valkenberg, Network Analysis, Prentice Hall of India

Reference books

1. Desoer C.A. & Kuh E.S., Basic Circuit Theory, McGraw Hill
2. Siskind, Electrical Circuits. McGraw Hill
3. Ryder J.D., Networks, Lines and Fields, Prentice Hall
4. Edminister, Electric Circuits, Schaum's Outline Series, McGraw Hill
5. Huelsman L.P., Basic Circuit Theory. Prentice Hall of India

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 EC 306 : ELECTRONIC CIRCUITS -I

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

BJT circuit models - Hybrid π model - Small signal low frequency and small signal high frequency models of BJT - Effect of temperature on BJT model parameters - h parameter equivalent circuits of CC, CB and CE configurations - Current gain - voltage gain - input and output impedances BJT amplifiers: Biasing - Load line - Bias stabilization - Stability factor - Bias compensation - Analyses and design of CC, CE and CB configurations - RC coupled and transformer coupled multistage amplifiers - High frequency response

Module II (13 hours)

FET amplifiers: Biasing of JFET - Self bias and fixed bias - Biasing of MOSFETS - Feedback biasing and fixed biasing for enhancement and depletion mode MOSFETs - Analyses of common source - Common drain and common gate amplifier configurations

Module III (13 hours)

Feedback - Effect of feedback on amplifier performance - Voltage shunt - Voltage series - Current series and current shunt feedback configurations - Positive feedback and oscillators -Analysis of RC Phase Shift, Wein bridge, Colpitts, Hartley and crystal oscillators - Stabilization of oscillations

Module IV (13 hours)

Power amplifiers - Class A, B, AB, C, D & S power amplifiers - Harmonic distortion - Efficiency - Wide band amplifiers - Broad banding techniques - Low frequency and high frequency compensation - Cascode amplifier - Broadbanding using inductive loads

Text books

1. Millman & Halkias, Integrated Electronics, McGraw Hill
2. Sedra A.S & Smith K.C., Microelectronic Circuits, Oxford University Press
3. Boylestad R. & Nashelsky L., Electronic Devices & Circuit Theory', Prentice Hall of India

Reference books

1. Hayt W.H., Electronic Circuit Analysis & Design, Jaico Pub.
2. Bogart T.F., Electronic Devices & Circuits', McGraw Hill
3. Horenstein M.N., Microelectronic Circuits & Devices', Prentice Hall of India
4. Schilling D.L. & Belove C., `Electronic Circuits', McGraw Hill
5. Baker R.J., Li H.W & Boyce D.E., CMOS - Circuit Design, Layout & Simulation, Prentice Hall of India

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 EC 307(P) : BASIC ELECTRONICS LAB

3 hours Practical per week

1. Series resonant and parallel resonant circuits - voltage and current amplification
2. Diode & Zener diode characteristics - dc and dynamic resistance
3. Constant -k low pass and high pass filters
4. First and second order LPF/HPF/BPF with R and C for a given cut-off frequency
5. Clipping circuits with diodes
6. Clamping circuits & voltage multipliers
7. Half wave rectifier with C, LC & CRC filters
8. Full wave rectifiers with C, LC & CRC filters
9. Zener diode regulator with emitter follower output - regulation curves
10. UJT characteristics & the relaxation oscillator
11. CB configuration - determination of h parameters
12. CE configuration - determination of h parameters
13. MOSFET characteristics in CS and CD modes

Sessional work assessment

Lab Practicals and Record	= 30
Test	= 20
Total marks	= 50

Reference books

1.Bhargava et.al., Basic Electronic Circuits and Linear Circuits, Tata McGraw Hill
2. Boylestead & Nashelski, Electronic Devices and Circuit Theory, 9th Ed, Pearson/PHI
3. Millman & Halkias, Integrated Electronics, Tata McGraw Hill

University evaluation will be for 100 marks of which 70 marks are allotted for writing the procedure/formulae/sample calculation details, preparing the circuit diagram/algorithm/flow chart, conduct of experiment, tabulation, plotting of required graphs, results, inference etc., as per the requirement of the lab experiments, 20 marks for the viva-voce and 10 marks for the lab record.
Note: Duly certified lab record must be submitted at the time of examination

2K6 EC 308(P) : ELECTRICAL ENGINEERING LAB

3 hours Practical per week

1. Plot open circuit characteristics of DC shunt generator for rated speed - Predetermine O.C.C. for other speeds - Determine critical field resistance for different speeds
2. Load test on DC shunt generator - Plot external characteristics - Deduce internal characteristics
3. Load test on DC series motor - Plot the performance characteristics
4. OC and SC tests on single phase transformer - Determine equivalent circuit parameters - Predetermine efficiency and regulation at various loads and different power factors - verify for unity power factor with a load test
5. Load test on 3 phase cage induction motor - Plot performance curves
6. Resistance measurement using a) Wheatstone's bridge b) Kelvin's double bridge
7. Measurement of self inductance, mutual inductance and coupling coefficient of a) Transformer windings b) air cored coil
8. Power measurement
9. Three voltmeter method b) three ammeter method
10. Power measurement in 3 phase circuit - Two wattmeter method
11. Extension of ranges of ammeter and voltmeter using shunt and series resistances

Sessional work assessment

Lab Practicals and Record	= 30
Test	= 20
Total marks	= 50

Text books

1. Hughes E., Electrical Technology, ELBS

University evaluation will be for 100 marks of which 70 marks are allotted for writing the procedure/formulae/sample calculation details, preparing the circuit diagram/algorithm/flow chart, conduct of experiment, tabulation, plotting of required graphs, results, inference etc., as per the requirement of the lab experiments, 20 marks for the viva-voce and 10 marks for the lab record.
Note: Duly certified lab record must be submitted at the time of examination

2K6 EC 401 : ENGINEERING MATHEMATICS III

3 hours lecture and 1 hour tutorial per week

Module I: (13 hours)

Complex analytic functions and conformal mapping: Complex functions – limits. derivative, analytic function- Cauchy-Riemann equations- elementary complex functions such as powers, exponential function, logarithmic, trigonometric and hyperbolic functions- Conformal mapping – Linear fractional transformations- mapping by elementary functions

Module II: (13 hours)

Complex integration: Line integral, Cauchy's integral theorem - Cauchy's integral formula – Taylor's series, Laurent series – residue theorem – evaluation of real integrals using integration around unit circle, around semicircle, integrating contours having poles on the real axis

Module III: (13 hours)

Jointly Distributed Random Variables: Joint distribution functions, independent random variables , covariance and variance of sums of random variables, joint probability distribution functions of random variables, conditional probability and conditional expectations. ***Curve fitting***: Method of least squares, correlation and regression, line of regression.

Module IV: (13 hours)

Vibrating strings: One dimensional wave equation – D' Alembert's solution – solution by method of separation of variables One dimensional heat equation - solution of the equation by the method of separation of variable Solutions of Laplace's equation over a rectangular region and a circular region by the method of separation of variable

Reference books

1. Kreyszig E. Advanced Engineering Mathematics. Wiley Eastern
2. Johnson, Miller and Freud. Probability and Statistics for Engineers, Pearson Education Asia.
3. Wylie .C.R. Advanced Engineering Mathematics, Mc Grawhill.
4. B.S. Grewal. Higher Engineering Mathematics, Khanna Publishers.
5. Freund. J.E. Mathematical Statistics, Prentice hall of India.

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 short type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 EC 402 : COMPUTER PROGRAMMING

3 hours lecture and 1 hour tutorial per week

Module I (15 hours)
Overview of C – Variables, Expressions and assignments, Lexical Elements, Fundamental Data Types, Operators *Control Statements* – if, switch-case, for , while, do, goto, break, switch *Functions*- Parameter passing , scope rules, recursion

Module II (12 hours)
Arrays – One dimensional and Multi Dimensional, *Pointer*-Linked List, Arrays of Pointers, Dynamic Memory Allocations, *Strings* – Operations and functions , *Bitwise Operators and Enumeration Types , Structures and Unions, Files and File Operations*

Module III (13 hours)
Overview of Java Language- Constants, Variables and Data Types, Operators and Expressions *Control Structures* – Decision Making, Branching and Looping, *Object Oriented Programming* – Concept of Classes, Objects and Methods, Benefits Java and OOP- Polymorphism and Overriding of methods, Inheritance

Module IV (12 hours)
Arrays and Strings, Interfaces, Multiple Inheritance, Packages – Putting Classes together – Managing Errors and Exceptions – Applet Programming and Graphics Programming (Basics only) – Managing Input/Output Files in Java

Text books
1. Kelley, Al & Pohl, Ira.,., *A Book on C- Programming in C*, 4th Ed,, Pearson Education (Modules I &II)
2. Balagurusamy E., Programming with Java: A Primer, 3rd Ed., Tata McGraw-Hill (Module III &IV)

Reference books
1. Balagurusamy E., Programming in ANSI C, Tata McGraw Hill
2. Eckel, Bruce., *Thinking in Java*, 2nd Ed, Pearson Education

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern
Q I - 8 **short** type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 EC 403 : COMMUNICATION ENGINEERING -I

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Random process: review of the theory of continuous random variables - joint distribution and density functions - conditional distribution functions - random process - ensemble average - stationarity - wide sense stationarity - time averages - ergodicity - correlation theory for WSS random process - power spectral density - Wiener - Khinchie Eiestein theorem - response of LTI systems to random process - guassian random process - filtered guassian random process - white guassian noise(**May be removed from the syllabus, Telephony can be considered)**

Module II (10 hours)

Noise: sources of noise - thermal noise - shot noise and flicker noise - filtered white noise - narrow band noise - quadrature representation - envelope and phase representation - signal to noise ratio - noise equivalent bandwidth - effective noise temperature - noise calculations for cascaded stages

Module III (15 hours)

Amplitude modulation: spectrum of amplitude modulated signal - power relations - AM generation and detection - DSB-SC generation and detection - SSB-SC generation and detection - VSB modulation - AM transmitter and receiver - TRF and superheterodyne receivers - noise analysis of AM receivers - SNR for envelope detection and coherent detection - SNR in DSB-SC and SSB-SC systems

Module IV (15 hours)

Frequency modulation: angle modulation - frequency modulation - narrow band FM - wide band FM - transmission bandwidth - generation of FM signals - direct and indirect methods - FM demodulators - noise in FM reception - threshold effect - pre-emphasis and de-emphasis

Text books

1. Simon Haykin, "Communication Systems", 3rd Edition, John Wiley & Sons
2. Ziemer R.E. & Tranter W.H., "Principles of Communication", JAICOP Publishing House
3. Dennis Roddy, John Coolen, "Electronic Communications", PHI

Reference books

1. Sam Shanmugam K., "Digital and Analog Communication Systems", John Wiley & Sons
2. Yannic Viniotis, "Probability for Electrical Engineers", McGraw Hill International
3. Lathi B.P., "Modern Digital and Analog Communication Systems", 3rd Ed., Oxford University Press.
4. Tomasi, Electronic Communication: Fundamentals Through Advanced, Pearson Education
5. Couch, Digital and Analog Communication Systems, Pearson Education

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 **short** type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 EC 404 : SIGNALS & SYSTEMS

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)
Introduction to signals and systems - Classification of signals - Basic operations on signals - Elementary signals - Concept of system - Properties of systems - Stability, invertability, time invariance - Linearity - Causality - Memory - Time domain description - Convolution - Impulse response - Representation of LTI systems - Differential equation and difference equation representations of LTI systems

Module II (15 hours)
Fourier representation of continuous time signals - Fourier transform - Existence of the Fourier integral - FT theorems - Energy spectral density and power spectral density - Frequency response of LTI systems - Correlation theory of deterministic signals - Condition for distortionless transmission through an LTI system - Transmission of a rectangular pulse through an ideal low pass filter - Hilbert transform - Sampling and reconstruction

Module III (13 hours)
Fourier representation of discrete time signals - Discrete Fourier series and Discrete Fourier transform - Laplace transform analysis of systems - Relation between the transfer function and differential equation - Causality and stability - Inverse system - Determining the frequency response from poles and zeros

Module IV (12 hours)
Z Transform - Definition - Properties of the region of convergence - Properties of the Z transform - Analysis of LTI systems - Relating the transfer function and difference equation - Stability and causality - Inverse systems - Determining the frequency response from poles and zeros

Text books
1. Haykin S. & Veen B.V., Signals & Systems, John Wiley
2. Oppenheim A.V., Willsky A.S. & Nawab S.H., Signals and Systems, Tata McGraw Hill
3. Taylor F.H., Principles of Signals & Systems, McGraw Hill

Reference books
1. Lathi B.P., Modern Digital & Analog Communication Systems, Oxford University Press
2. Haykin S., Communication Systems, John Wiley
3. Bracewell R.N., Fourier Transform & Its Applications, McGraw Hill
4. Papoulis A., Fourier Integral & Its Applications, McGraw Hill

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern
Q I - 8 **short** type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 EC 405 : ELECTRONIC CIRCUITS - II

3 hours lecture and 1 hour tutorial per week

Module I (13 hours)

RC circuit as integrator and differentiator - Compensated attenuators - Pulse transformer - Pulse response Switching characteristics of a BJT - BJT switches with inductive and capacitive loads - Non saturating switches - Emitter follower with capacitive loading - Switching characteristics of a MOS inverter - Resistive load & active load configurations - CMOS inverter - Dynamic power dissipation

Module II (13 hours)

Monostable and astable multivibrators - Collector coupled monoshot - Emitter coupled monoshot - triggering the monoshot - Collector coupled and emitter coupled astable multivibrator - Astable - monostable and bistable operations using negative resistance devices - Multivibrators with 555 IC timer- Astable, monostable, bistable circuits with logic gates

Module III (13 hours)

Phase Locked Loops - Phase detector (XOR & phase frequency detectors) - Voltage Controlled Oscillator (Current starved & source coupled CMOS configurations) - Loop filter - Analysis of PLL - Typical applications of PLL - Voltage and current time base generators - Linearization - Miller & bootstrap configurations

Module IV (13 hours)

Digital to analog converters - R-2R ladder - Binary weighted - Current steering - Charge scaling - Cyclic & pipeline DACs - Accuracy - Resolution - Conversion speed - Offset error - Gain error - Integral and differential nonlinearity - Analog to digital converters – Track and hold operation - Track and hold errors - ADC conversion techniques - Flash converter - Two step flash - Pipeline – Integrating - Staircase converter - Successive approximation converter - Dual slope & oversampling ADCs

Text books

1. Millman J. & Taub H., Pulse, Digital & Switching Waveforms, Tata McGraw Hill
2. Baker R.J., Li H.W. & Boyce D.E., CMOS - Circuit Design, Layout & Simulation, Prentice Hall of India

Reference books

1. Taub & Schilling, Digital Integrated Electronics, McGraw Hill
2. Sedra A.S.& Smith K.C., Microelectronic Circuits, Oxford University Press
3. D.A. Hodges., and G. Jackson., Analysis and Design of Digital Integrated Circuits, Mc Graw Hill

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 **short** type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 EC 406 : DIGITAL ELECTRONICS

3 hours lecture and 1 hour tutorial per week

Module I (12 hours)

Basic digital circuits - Review of number systems and Boolean algebra - Simplification of functions using Karnaugh map and Quine McCluskey methods - Boolean function implementation - Code converters - Encoders and decoders - Multiplexers and demultiplexers - ROMs - Combinational logic design using decoders - Multiplexers and ROMs

Module II (12 hours)

Hazards in combination circuits – static and dynamic.

Arithmetic circuits - Half and full adders and subtractors - Carry look ahead adders - BCD adder - Multiplier and divider circuits - Sequential circuits - Latches and flip flops (RS, JK, D, T and Master Slave) - Design and analysis of ripple counters - Shift registers - Johnson and ring counters

Module III (14 hours)

Design and analysis of sequential circuits - General model of sequential networks –

Hazards in sequential networks - synchronous design method - clock skew - asynchronous inputs - synchroniser failure and metastability

State diagrams – Synchronous counter design - Analysis of sequential networks - Derivation of state graphs and tables - Reduction of state table - Sequential network design

Module IV (14 hours)

Logic families - Fundamentals of RTL, IIL, DTL and ECL gates - TTL logic family - TTL transfer characteristics - TTL input and output characteristics - Tristate logic - Shottkey and other TTL gates - MOS gates - MOS inverter - CMOS inverter - Rise and fall time in MOS and CMOS gates - Speed power product - Interfacing BJT and CMOS gates .

Text books

1. Roth C.H., Fundamentals of Logic Design, Jaico Pub.
2. Mano M.M., Digital Design, Prentice Hall of India
3. Taub B. & Schilling D., Digital Integrated Electronics, McGraw Hill
4. Jain R.P., Modern Digital Electronics, Tata McGraw Hill
5. John F. Wakerly, "*Digital Design: Principles and Practices"*, PHI Inc

Reference books

1. Morris R.L., Designing with TTL Integrated Circuits, McGraw Hill
2. Katz R.H., Contemporary Logic Design, Benjamin/Cummings Pub.
3. Lewin D. & Protheroe D., Design of Logic Systems, Chapman & Hall

Sessional work assessment

Assignments	2x10 = 20
2 tests	2x15 = 30
Total marks	= 50

University examination pattern

Q I - 8 **short** type questions of 5 marks, 2 from each module
Q II - 2 questions A and B of 15 marks from module I with choice to answer any one
Q III - 2 questions A and B of 15 marks from module II with choice to answer any one
Q IV - 2 questions A and B of 15 marks from module III with choice to answer any one
Q V - 2 questions A and B of 15 marks from module IV with choice to answer any one

2K6 EC 407(P) : ELECTRONIC CIRCUITS LAB

3 hours Practical per week

1. Feed back voltage regulator with short circuit protection
2. Biasing circuits- fixed bias-self bias- voltage divider.
3. Emitter follower with & without complementary transistors – Frequency and phase response for a capacitive load
4. Single stage RC coupled amplifier – Frequency response
5. Phase shift oscillator using BJT/FET
6. Hartley / Colpitts oscillator using BJT/FET
7. Power amplifier – Class A
8. Power amplifier – Class AB
9. Cascode amplifier – Frequency response
10. Cascaded RC coupled amplifier – Frequency response
11. Active load MOS amplifier
12. Wide band single BJT/MOS voltage amplifier with inductance
13. Single BJT crystal oscillator

Sessional work assessment

Lab Practicals and Record	= 30
Test	= 20
Total marks	= 50

Reference books

1. Boylestead & Nashelski, *Electronic Devices and Circuit Theory*, 9th Ed, Pearson/PHI
2. Millman & Halkias, *Integrated Electronics*, Tata McGraw Hill

University evaluation will be for 100 marks of which 70 marks are allotted for writing the procedure/formulae/sample calculation details, preparing the circuit diagram/algorithm/flow chart, conduct of experiment, tabulation, plotting of required graphs, results, inference etc., as per the requirement of the lab experiments, 20 marks for the viva-voce and 10 marks for the lab record.
Note: Duly certified lab record must be submitted at the time of examination

2K6 EC 408(P) : DIGITAL ELECTRONICS LAB

3 hours practicals per week

List of experiments:

1. Familiarization with TTL ICs
2. Characteristics of TTL NAND gate
3. Arithmetic circuits
4. Flip-Flops
5. Counters and Sequence generators
6. Twisted counters
7. Registers
8. Encoders and Decoders
9. Multiplexers and Demultiplexers
10. ADC and DAC
11. CMOS logic circuits
12. Multivibrators using logic gates

Sessional work assessment

Lab Practicals and Record	= 30
Test	= 20
Total marks	= 50

Reference books

1. Jain R.P., Modern Digital Electronics, Tata McGraw Hill
2. Mano M.M., *Digital Design*, Prentice Hall of India
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