UNIVERSITY OF CALICUT

Faculty of Engineering

Curriculum, Scheme of Examinations and Syllabi for B.Tech Degree Programme with effect from Academic Year 2000-2001

EC: Electronics & Communication Engineering

THIRD SEMESTER

Code	Subject	Hours/Week			Sessional Marks	University Examination	
		L	T	P/D		Hrs	Marks
EC2K 301	Engineering Mathematics III	3	1	-	50	3	100
EC2K 302	Electrical Circuits & Network Theory	3	1	-	50	3	100
EC2K 303	Solid State Devices	3	1	-	50	3	100
EC2K 304	Basic Electronics	3	1	-	50	3	100
EC2K 305	Digital Electronics	3	1	-	50	3	100
EC2K 306	Electrical Engineering	3	1	-	50	3	100
EC2K 307(P)	**Basic Electronics Engineering Lab**	-	-	3	50	3	100
EC2K 308(P)	**Electrical Engineering Lab**	-	-	3	50	3	100
TOTAL		**18**	**6**	**6**	**400**	**-**	**800**

EC2K 301 : ENGINEERING MATHEMATICS III

(same as AI2K/CH2K/CE2K/EE2K/IC2K/ME2K/PE2K/PM2K/PT2K 301)

3 hours lecture & 1 hour tutorial per week

Module I: Linear algebra I (13 hours)

Vector spaces - subspaces - linear dependence and independence - bases and dimension - linear transformations - sums, products and inverses of linear transformations - linear operator equations

Module II: Linear algebra II (13 hours)

Rank and equivalence of matrices - quadratic forms - characteristic values and characteristic vectors of a matrix - transformation of matrices - functions of a square matrix

Module III: Probability distributions (13 hours)

Random variables - binomial distribution - hypergeometric distribution - Poisson distribution - mean and variance of probability distribution - Chebyshev's theorem - Poisson processes - geometric distribution - continuous random variables - normal distribution - uniform, log-normal, gamma, beta and Weibull distributions

Module IV: Statistical inference (13 hours)

Populations and samples - sampling distributions of mean and variance - point estimation - interval estimation - Bayesian estimation - null hypotheses and significance tests - hypothesis concerning one mean - relation between tests and confidence intervals - operating characteristic curves - inferences concerning two means - randomization and pairing - estimation of variances - hypotheses concerning one variance - hypotheses concerning two variances - test of goodness of fit

Text books

1. Wylie C.R. & Barrett L.C., *Advanced Engineering Mat hematics,* McGraw Hill

2. Johnson R.A., *Miller & Freund's Probability & Statistics for Engineers,* Prentice Hall of India

Reference books

1. Hadley G., *Linear Algebra* , Addison Wesley
2. Kreyszig E., *Advanced Engineering Mathematics* , Wiley Eastern
3. Kreider D.L., Kuller R.G., Osterberg & Perkins F.W., *Introduction to Linear Analysis* , Addison Wesley
4. Levin R.I. & Rubin D.S., *Statistics for Management* , Prentice Hall of India
5. Lipschutz S., *Linear Algebra - Schaum's Outline Series* , McGraw Hill
6. Chatfield C., *Statistics for Tec hnology,* Chapman & Hall
7. Walpole R.E. & Meyers, *Probability & Statistics for Engineers & Scientists,* 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

EC2K 302 : ELECTRICAL CIRCUITS & 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

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EC2K 303 : SOLID STATE DEVICES

3 hours le cture 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 - Ga As isotype diodes

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 - Kirk effect - Hetero junction GaAs BJTs - UJT - concept of dynamic negative resistance

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 - GaAs MESFET

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. *Physics of Semiconductor Devices* , Michael A.Shur, 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 Devi ces*, McGraw Hill
4. Yang E.S., *Microelectronics Devices* , McGraw Hill

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EC 2K 304 : BASIC ELECTRONICS

(common with PT2K 304)

3 hours lecture and 1 hour tutorial per week

Module I (10 hours)

Thermionic emission - high field emission - secondary emission - Richardson's equation - Child-Langmuir law - vacuum tubes - diodes, triodes and pentodes - their characteristics & parameters - amplification

Module II (13 hours)

Resistors - types and tolerance - AF and RF chokes - transformers - types of capacitors - specifications & constructional details - rectifiers & filters - half wave, full wave and bridge rectifier configurations (analysis & design) - ripple factor - rectification efficiency - peak inverse voltage - transformer utilization factor - analysis & design of C, LC, CLC and CRC filters, m - phase rectifiers

Module III (12 hours)

Diode circuit models - DC - low frequency small signal and high frequency small signal models - voltage multiplier circuits, diode clipping and clamping circuits - regulators - zener diode regulator - series pass transistor feedback voltage regulator - emitter follower output regulator - short circuit protection - load and voltage regulation curves

Module IV (17 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 - small signal low frequency and small signal high frequency models of MOSFET - effect of temperature on MOSFET model parameters - equivalent circuits of CS and CD configurations

Text books

1. Grob B., *Basic Electronics* , McGraw Hill
2. Milman & Halkias, *Electronic Devices & Ci rcuits*, McGraw Hill
3. Boylestad R. & Nashelsky L., *Electronic Devices & Circuit Theory* , Prentice Hall of India

Reference books

1. Bogart T.F., *Electronic Devices & Circuits* , McGraw Hill
2. Horenstein M.N., *Microelectronic Circuits & Devices* , Prentice Hall of India
3. Mottershead A., *Electronic Devices & Circuits* Prentice Hall of India

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EC2K 305 : DIGITAL ELECTRONICS

(common with AI2K 305)

3 hours lecture & 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)

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 - 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 - semiconductor memories

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

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
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Total marks	= 50

University examination pattern

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EC2K 306 : ELECTRICAL ENGINEERING

(common with AI2K/PT2K 306)

3 hours lecture & 1 hour tutorial per week

Module I: DC machines (10 hours)

Types of DC machines - DC generators - emf equation - open circuit and load characteristics of different types of DC generators - DC motors - principle of operation - types - torque equation - characteristics - starters

Module II: Transformers (10 hours)

Principle of operation - emf equation - phasor diagram - equivalent circuit - OC and SC tests - basic principles of auto transformer and three phase transformer

Module III: AC machines (17 hours)

Alternator - rotating field - frequency effect of distribution of winding - emf equation - losses and efficiency of synchronous motor - torque equation - starting methods - induction motor - constructional features - principle of operation of 3 phase induction motor - vector diagram and equivalent circuits - starting and speed control of squirrel cage and wound rotor induction motor

Module IV: Electrical measurements (15 hours)

Principle of moving coil, moving iron and dynamometer type instruments - extension of range of voltmeter and ammeter - measurement of 3 phase power by two wattmeter method - DC slidewire, potentiometer - wheat stone bridge - Kelvin's double bridge - AC bridges - Schering bridge, Maxwell's bridge - principle of energy meter

Text book

Hughes E., *Electrical Technology* , ELBS

Reference books

1. Cotton H., *Electrical Technology* Pitman
2. Golding, *Electrical Measurements and Measuring Instruments* , ELBS

Sessional work assessment	
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EC2K 307(P) : BASIC ELECTRONIC ENGINEERING LAB

3 hours practicals 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 & record	= 30
2 tests	2x10= 20
Total marks	= 50