N.C.College of Engineering

Israna-132107 (Panipat)

Scheme and Syllabus

w.e.f 2015-16 Session

ELECTRONICS & COMMUNICATION ENGINEERING

Second Year (3rd and 4th Semester)

SCHEME OF STUDIES & EXAMINATION

B.TECH (Semester III)

Electronics & Communication Engineering

S. No	Subject Code	Subject	BOS	L	T	P	Contact Hours	Credit
1.	MGT-231	Industrial Economics	MGT.	3	0	-	3	3
2.	MATH-231	Mathematics – III	Science	3	1	-	4	3
3.	EC-231	Semiconductor Devices & Circuits	ECE	3	1	-	4	4
4.	EC-232	Signals & Systems	ECE	3	1	-	4	4
5.	EC-233	Digital Electronics	ECE	3	1	-	4	4
6.	EC-234	Networks Analysis & Synthesis	ECE	3	2	-	5	4
7.	EC-23P1	PSPICE Lab	ECE	-	-	2	2	1
8.	EC-23P2	Digital Electronics Lab	ECE	-	-	2	2	1
9.	EC-23P3	Electronics Workshop (PCB Designing)	ECE	-	-	2	2	2
10	EC-23A	Society and School Connect Program	ECE	-	-	-	-	Audit course
11	MATH-200	Foundation Mathematics (For LEET Students)	Science	2	0	0	2	2
		Total		20	6	6	32	30

3rd Semester (ELECTRONICS & COMMUNICATION)
INDUSTRIAL ECONOMICS
MGT-231

L	T	On Semester Evaluation 100
3	0	End Semester Evaluation 100

Note: - 1. There are NINE questions in a set of question-paper. All questions carry equal marks.

2. Attempt five questions in all. FIRST question is compulsory which covers the whole syllabus. Attempt ONE question from each of the other four Units.

UNIT-I

Characteristics and Principles of Management- Meaning Management as an Art, Science and Profession, Functions of Management, Corporate Social Responsibility
Communication -Process and Barriers.

UNIT-II

Marketing Management-Meaning, Nature, Scope and Functions of marketing Management, Marketing Research, Marketing Mix, Marketing Information system
International Marketing Management- Meaning, Nature and Scope.

UNIT-III

Financial Management-Objectives, Scope and Functions of financial management, Capital Structure, Sources of Finance, Project Management- meaning, Feasibility study of Project, Social Cost Benefit Analysis.

UNIT-IV

Human Resource Management- Meaning, Nature, Scope and Functions of Human Resource Management, Difference between Personal management and Human Resource Management, Job Analysis-meaning and process, Performance Appraisal

Suggested Readings

a) Philip Kotler.(2003). Marketing Management: Analysis, Planning, Implementation and Control. Prentice Hall of India
b) Michael, J.E.,Bruce, J.W. and William, J.S. (13th Edition,2004). Marketing Management. Tata McGrawHill, New Delhi.
c) Aswatthapa, K.; Human Resource and Personnel Management, TMH, 1997
d) C.B.Gupta Management Theory and Practice, Sultan Chand and Sons
e) D. Cenzo, D.A. & Robbins S.P. : Human Resource Management, 5th ed, NY, 1994
f) Pandy I.M Financial Mgt, Vikas Publication
g) Parsana Chandra, Financial Mgt, Tata McGraw New Delhi
h) Khan M.Y and Jain P.K Financial Mgt, Problem and Cases, Tata McGraw Hill,New Delhi

B.TECH III SEMESTER
DIGITAL ELECTRONICS
(EC-233)

L	T	Cr	
3	2	4	

On Semester Evaluation:100 Marks
End Semester Evaluation: 100 Marks
Time: 3 hrs
Marks:100

NOTE: There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b ,c ,d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

UNIT-I

Fundamentals of Digital Techniques: Digital signal, Comparison of analog & digital systems, Logic gates : AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR, Boolean algebra, Binary codes: BCD, Excess-3, Gray codes, ASCII codes.
Combinational Design Using Gates: Standard representation for logical functions, Design using gates, Karnaugh map and Quine-Mcluskey methods of simplification up to six variables.

UNIT-II

Combinational Design Using MSI Devices: Adders:-Half Adder, Full Adder(Serial & Parallel), Look Ahead Carry, Subtracters: Half Subtracter, Full Subtracter, BCD arithmetic circuits, Comparators, Multiplexers and Demultiplexers and their use as logic elements, Encoders, Decoders, BCD to seven segment display devices.
Sequential Circuits: Flip Flops: S-R, D, J-K,T, Master-slave, Edge-triggered & level-triggered flip-flops, Conversion of flip-flops, Shift registers, Counters : Asynchronous and Synchronous, Ring counters and Johnson Counters, Design of Synchronous and Asynchronous sequential circuits.

UNIT-III

Digital Logic Families: Switching Characteristics of diodes and transistors, Characteristics of Digital ICs, Bipolar logic families: RTL, DTL, DCTL. HTL, TTL (Totem pole, schottky arrangement), ECL, MOS and CMOS logic families, Interfacing CMOS & TTL, Tristate logic.

UNIT-IV

A/D and D/A Converters: Sample and hold circuit, Quantization, D/A converters :- Weighted Resistor and R -2 R ladder D/A Converters, Specifications for D/A converters, A/D converters:- Parallel-comparator, Successive approximation, Dual-slope ADC, Specifications of ADCs.
Programmable Logic Devices: ROM, PROM, EPROM, EEPROM, Flash Type, RAM: Static and Dynamic memory, PLA. PAL, Introduction to FPGA and CPLDs.

TEXT BOOK:

1. **Modern Digital Electronics (Edition III): R. P. Jain; TMH**
2. **Digital Principles and Applications: Malvino & Leech; McGraw Hill.**

REFERENCE BOOKS:

1. **Digital Integrated Electronics: Taub & Schilling: MGH**
2. **Fundamentals of Digital Circuits: Anand Kumar; PHI**
3. **Digital Design: Morris Mano: PHI,**

B.TECH III SEMESTER

NETWORK ANALYSIS & SYNTHESIS

(EC-234)

L	T	Cr	On Semester Evaluation:100 Marks
3	2	4	End Semester Evaluation: 100 Marks
Time: 3 hrs			Marks:100

Note: There will be nine questions in total. Question no. 1 is compulsory and will have four parts a, b, c, d covering the entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

UNIT-I

Graph Theory and Network Equations: Introduction, Graph of a network,Trees,Co-trees & loops, Incidence Matrix, Cut-Set Matrix, Tie-set Matrix & Loop currents, Number of Possible trees of a graph, Analysis of Networks, Network Equilibrium equations

Transient Response: Transient response of Series R-L,R-C, RLC series circuits to D.C and sinusoidal excitation. Laplace Transformation and its applications in circuit analysis.

UNIT-II

Network Function: Ports and Terminal pairs, Determinants and co-factors for determining network functions, Network functions for one port and two port networks, Poles and zeros of network functions, Necessary conditions for driving point functions, Necessary conditions for transfer functions.

Resonance: Series resonance, Variation of impedance and admittance with frequency, Variation of current and voltage across L and C with frequency, Effect of resistance on frequency response curve, Selectivity and bandwidth, Q-factor, Effect of source impedance on selectivity, Parallel resonance, Condition for maximum impedance.

UNIT-III

Two Port Networks: Characterization of linear time invariant two-port networks, Open circuit impedance parameters, Short circuit admittance parameters, Transmission Parameters, Hybrid parameters, Interrelationship between the parameters, Interconnection of two-port networks, Two port symmetry, Input impedance in terms of two port parameters, output impedance, Image impedances, Lattice network.

UNIT-IV

Types of Filters and Their Characteristics: Filters fundamentals, Low pass, High pass, Band pass and band stop constant k-filters, m-derived Filters and their analysis, Impedance matching of filt ers, Composite filters.

Network Synthesis: Hurwitz polynomial & its properties, Procedure of testing a given polynomial for Hurwitz character. Positive real functions and its properties, Procedure of testing of Positive Real(PR) function,Hurwitz polynomial, Synthesis of one port networks: Foster-I and Foster-II form, Cauer-I and Cauer-II form.

TEXT BOOKS:

Network analysis and synthesis: F.F.Kuo; John Wiley and sons inc.

2. Network analysis and synthesis: Umesh Sinha; Satya Prakash pub.

REFERENCE BOOKS:

Network analysis: Van Valkenburg; PHI

A course in electrical circuit analysis by Soni Gupta; Dhanpat Rai Publication

Network and systems: D.Roy Choudhary;New Age International

B.TECH III SEMESTER
MATHEMATICS-III
(MATH-231)

L	T	Cr	On Semester Evaluation:100 Marks
4	1	5	End Semester Evaluation: 100 Marks

Time: 3 hrs **Marks:100**

Note: 1. There are nine questions in a set of question paper. All questions will carry equal marks.

2. The students are required to attempt five questions in all selecting one from each unit and First question is compulsory.

UNIT-I

Partial Differential Equations: Formation of partial differential equations, Lagrange's linear partial differential equation, First order non-linear partial differential equation, Charpit's method.

UNIT-II

Functions of a Complex Variables: Exponential function, Trigonometric, Hyperbolic and Logarithmic functions, limit and continuity of a function, Differentiability and analyticity. Cauchy-Riemann equations, Necessary and sufficient conditions for a function to be analytic, Polar form of the Cauchy-Riemann equations, Harmonic functions, Application to flow problems

UNIT-III

Integration of complex functions, Cauchy-Integral theorem and formula, Power series, radius and circle of convergence. Taylor's, Maclaurin's and Laurent's series. Zeros and singularities of complex function, Residues. Integration of real integrals using residues(around unit and semi circle only)

UNIT-IV

Power series methods for solutions of ordinary differential equations. Bessel Equation, Recurrence formula for Jn(x), generating function for Jn(x), Equation reducible to Bessel function, Orthogonality of Bessel function, Legendre equation and Legendre polynomials, Rodrigue's Formula, Generating function for Pn(x), Recurrence formula for Pn(x).

Textbooks

Kresyzig, E., "Advanced Engineering Mathematics", John Wiley and Sons. (Latest edition).
Ramana, B.V., "Higher Engineering Mathematics" Tata McGraw-Hill.
Jain, R. K. and Iyengar, S. R. K. "Advanced Engineering Mathematics", Narcosis, 2003 (2nd Ed.)
Mathur A. B., Jaggi V. P., "Advanced Engineering Mathematics", Khanna Publishers.
Grewal, B.S., "Higher Engineering Mathematics", Khanna Publishers.

References:

Mitin, V. V., Polis, M. P. and Romanov, D. A., "Modern Advanced Mathematics for Engineers", John Wiley and Sons, 2001.
Wylie, R., "Advanced Engineering Mathematics", McGraw-Hill, 1995.
Sastry , S. S. , "Engineering Mathematics Part-II" , Prentice Hall of India.

B.TECH III SEMESTER
SEMICONDUCTOR DEVICES AND CIRCUITS
(EC-231)

L	T	Cr	On Semester Evaluation:100 Marks
3	1	4	End Semester Evaluation: 100 Marks

Time: 3 hrs **Marks:100**

NOTE: There shall be nine questions. Question No. 1 is compulsory and will have four parts a, b, c, d Covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

UNIT-1

P-N Junction diode : Review of PN Junction, Diode resistance and capacitance, Junction Didode swiching Time, Breakdown voltages, Diode as circuit element, Applications of diode: Clippers, Clampers, Voltage multipliers & Comparators, Load line concept, Types of filter circuits, Zener diode as a voltage regulator.

UNIT-II

Bipolar Junction Transistor : Review of BJT, Transistor biasing: Operating point, Bias stability and Stability factor, Simple transistor biasing circuit, Collector to base bias circuit, Emitter bias, Voltage divider bias circuit, Bias compensation. Frequency response of RC Coupled amplifier, Multistage amplifiers, Classifications of amplifiers. High frequency limitations on BJT.
Hybrid model: Analysis of transistor amplifier using h-parameter, Miller theorem, Emitter follower.

UNIT-III

Feedback in amplifiers : Concept of feedback, Advantages of negative feedback, Basic feedback topologies.
Oscillators : General form of oscillator, Barkhausen criterion, Operation of tuned circuit and types of oscillators such as tuned collector ckt, Colpitt, Hartley, Phase shift, Wein bridge oscillator, and crystal oscillator.
Power Amplifiers : Class A, Class B, Class AB, Class C, Class D, Class E Amplifiers and their applications.

UNIT-IV

Field Effect Transistor : Introduction to field effect transistors, FET parameters, Their V-I characteristics, small signal model of JFET, Biasing of JFET, FET as an Amplifier,
MOSFET: Enhancement and Depletion type MOSFET, V-MOSFET, C-MOSFET, Biasing of MOSFET, Comparison between BJT, FET AND MOSFET.

TEXT BOOKS:
Integrated Electronics - Millman & Halkias (Tata McGraw Hill)
Electronic Devices & Circuits - J.B.Gupta (Katson Publications)

REFERENCE BOOKS:
Electronic Devices & Circuits—Boylestad and Nashelsky
Electronic Principles - Malvino (McGraw Hill)
Electronic Devices & Circuits – Sanjeev Gupta

B.TECH III SEMESTER
SIGNAL AND SYSTEMS.
(EC-232)

L	T	Cr	
3	1	4	

On Semester Evaluation:100 Marks
End Semester Evaluation: 100 Marks

Time: 3 hrs **Marks:100**

NOTE: There shall be nine questions. Question No. 1 is compulsory and will have four parts a, b, c, d Covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

UNIT-I

Introduction to Signals and Systems : Classification of signals, Classification and models of systems, Analog and discrete signals, singular functions, Signal representation in terms of singular functions, Orthogonal functions and their use in signal representation.

Time-domain analysis of continuous-time systems & discrete-time systems : LTI systems and their properties, Zero-input and zero-state response, The impulse response, Stability.

UNIT-II

Discretisation of analog signals : Sampling, Sampling theorem and its proof, Effect of under-sampling, Recovery of analog signals from sampled signals, Characterization of discrete signals in terms of impulse sequences.
Discrete-time system analysis using the z-transform : Definition and properties, Solution of difference equations, The transfer function Stability, Frequency response.

UNIT-III

Continuous-time signal analysis : The Fourier series, The physical meaning of Fourier expansion, Trigonometric and exponential forms, Orthogonality, Parseval's theorem.
Continuous-time signal analysis: The Fourier Transform, The physical meaning, Definition and basic properties, Energy and Parseval's theorem.
Continuous-time system analysis using the Laplace Transform : Definition and properties, Solution of equations for continuous-time systems.

UNIT-IV

Probability concepts: Random variable, PDF, CDF, Moments, Distributions, Correlation functions, Characterization of stochastic signals.
System Modeling: Modeling in terms of differential, equations, state variables, difference equations and transfer functions.

TEXT BOOKS:

1. **Simon Haykins – "Signal & Systems", Wiley Eastern**
2. **B. P. Lathi-"** ***Linear Systems and Signals"*****, 2nd ed., Oxford University Press, 2005.**

REFERENCE BOOKS :

1. **Fred J Taylor –"Principles of Signals and System", MGH.**
3. **A Papoulis – "Circuit and System" Modern Approach HRW**

B.TECH III SEMESTER
DIGITAL ELECTRONICS LAB
(EC-23P2)

P	Cr	
2	**1**	**On Semester Examination : 120 Marks** **End Semester Examination: 80 Marks**

LIST OF EXPERIMENTS:

1. Verification of TTL gates AND, OR, NOT, NAND, NOR, EX-OR, EX-NOR.
2. Design and realize a given function using K-Maps and verify its performance.
3. To verify the operation of half adder and full adder using gates.
4. To verify the operation of half subtractor and full subtractor using gates.
5. To verify the operation of Comparator.
6. To verify the operation of Multiplexer and Demultiplexer.
7. To verify the operation of Encoder and Decoder.
8. To verify the operation of BCD to 7 segment Decoder.
9. To verify the truth table of S-R, J-K, T, D Flip-flops using various gates.
10. To verify the operation of Bi-directional shift register.
11. To design and verify the operation of decade counter.
12. To design and verify the operation of 4-bit Asynchronous UP/DOWN counter.

NOTE: Atleast 10 experiments are to be performed from above list.

B.TECH III SEMESTER
PSPICE LAB
(EC-23P1)

P	Cr		
2	**1**	**On Semester Examination:**	**120 Marks**
		End Semester Examination:	**80 Marks**

LIST OF EXPERIMENTS:

1. To design and simulate all the gates.
2. To design and simulate low pass and high pass filter circuits.
3. To design and simulate clippers circuit.
4. To design and simulate clampers circuits.
5. To design and simulate class-A power amplifier.
6. To design and simulate wein bridge oscillator circuit.
7. To design and verify RC – coupled amplifier circuit.
8. To study the frequency response of CE amplifier.
9. To study the frequency response of CB amplifier.
10. To study the frequency response of CC amplifier.

SCHEME OF STUDIES & EXAMINATION

B.TECH (Semester IV)

Electronics & Communication Engineering

S. No.	Subject Code	Subject	BOS	L	T	P	Hours	Credit
1		* Elective	ECE	3	1	-	4	4
2	EC-241	Analog Communication	ECE	3	1	-	4	4
3	EC-242	Measuring Instruments & Transducers	ECE	3	1	-	4	4
4	EC-243	Fields & Waves	ECE	3	2	-	5	4
5	EC-244	Linear Integrated Circuits & Applications	ECE	3	1	-	4	4
6	EC-245	Microelectronics Engineering	ECE	3	1	-	4	4
7	EC-24P1	Analog Communication Lab	ECE	-	-	2	2	1
8	EC-24P2	Measuring Instruments & Transducers Lab	ECE	-	-	2	2	1
9	EC-24P3	Electronics Workshop (Hands on practice of LICA with Proteus)	ECE	-	-	4	4	2
10	EC-24P4	Seminar	ECE	-	-	-	2	Audit
11	EC-246	General Proficiency & Fitness	ECE	-	-	-	-	1
		TOTAL		18	7	8	35	29

*** List of Electives**

i) Power Electronics (EC-24E1)
ii) Electromechanical Energy Conversion (EC-24E2)
iii) Numerical methods and linear programming(MATH-OE1).

ELECTROMECHANICAL ENERGY CONVERSION

(EC-24E2)

L	T	Cr	On Semester Evaluation:100 Marks
3	1	4	End Semester Evaluation: 100 Marks
Time: 3 hrs			Marks:100

NOTE: There shall be nine questions. Question No. 1 is compulsory and will have four parts a, b, c, d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

UNIT – I

Magnetic Circuits and Induction: Magnetic Circuits, Magnetic Materials and their properties, Static and dynamic emfs & force on current carrying conductor, Hystersis Curve, Hysteresis and Eddy current losses, Frictional & copper losses. Force and torque in magnetic field system,
Transformers: Basic theory, Principle, Construction, Operation at no-load and full-load, Equivalent circuit, Phasor diagrams, O.C.and S.C. tests for parameters determination, Efficiency, All day Efficiency and Voltage Regulation, Auto-transformer, Introduction to three-phase transformer; Scott connection, Parallel operation of single & three phase transformer.

UNIT – II

DC Machines: Basic theory, Principle, Construction of DC generator and motor, EMF equation, Load characteristics, Concept of back emf, Torque and power equations, Starting and speed control of DC motors, Types of DC generator & motors, Armature reaction, Commutation, Characteristics of DC machines, Applications of DC machines.

UNIT – III

Induction Motor: Basic theory, Principle, Construction, Advantage of IM over other conventional machines, Equivalent circuit, Phasor diagram, Torque equation, Load characteristics, Starting speed control of induction motor, Introduction to single phase Induction motor, Double field revolving theory, Types of single phase IM and its applications, Open circuit & block rotor test.

UNIT-IV

Synchronous Machines: Principle, Construction, and basic theory of synchronous generator, Equivalent Circuit, EMF equation, Advantages of stationary armature, Voltage Regulation, Basic theory of synchronous motor, V-curves, Starting of synchronous motor, Comparison between synchronous & induction motor.

Text Books:

1. **Electrical Machines: P.S. Bimbhra; Khanna.**
2. **Electrical Machines :J.B. Gupta ; Kataria & Sons.**
3. **Electrical Machines : A. Husain ; Dhanpat Rai.**

Reference Books :

1. **Electrical Machines : Nagrath and Kothari; TMH**
2. **Electrical Machines : Mukherjee and Chakravorti; Dhanpat Rai & Sons.**
3. **Electrical Technology (Vol-II) : B.L. Theraja; S. Chand.**

B.TECH IV SEMESTER

Linear IC & Applications
(EC-244)

L	T	Cr	On Semester Evaluation:100 Marks
3	1	4	End Semester Evaluation: 100 Marks
Time: 3 hrs			Marks:100

NOTE: There shall be nine questions. Question No. 1 is compulsory and will have four parts a, b, c, d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks**.** Question paper should have 25 % numerical part.

UNIT-I

Introduction to Op-amps: Short history, Linear vs Digital Electronics, Block diagram, Representation of a typical op-amp, Basic differential amplifier, Differential amplifier circuit configurations: Dual input balanced output, Dual input unbalanced output, Single input balanced output, Single input unbalanced output & their Analysis using h-model & r-model, Constant current bias circuit, Current mirror circuit, DC coupling & Cascaded differential amplifier stages, Level translator circuit, FET Differential Amplifier.

Integrated Circuits: Types of Integrated Circuits, Manufacturer's designation for Integrated Circuit, Development of Integrated Circuits, Pin identification & Temperature range, Power supplies for Integrated circuits, Characteristics parameters, The ideal op-amp, Equivalent circuit of op-amp, Open loop op-amp Configurations.

UNIT-II

Op-Amp with Negative Feedback and Frequency Response: Block Diagram representation of feedback amplifier, Voltage series feedback, Voltage shunt feedback differential amplifiers, Frequency response, Compensating network, Frequency response of internally compensating op-amp and non-compensating op-amp, High frequency op-amp equivalent circuit, Open loop gain v/s frequency, Closed loop frequency response, Circuit stability, Slew rate, The practical op-amp.

UNIT-III

Op-Amp Applications: DC, AC amplifiers, Peaking amplifier, Summing, Scaling, Averaging and Instrumentation amplifier, Differential input output amplifier, Voltage to current converter, Current to voltage converter, Very high input impedance circuit, Integration and differentiating circuits, Wave shaping circuit, Active filters, Oscillators, Comparators, Peak detector, Log & antilog amplifiers, Sample & hold circuit, Full wave rectifier.

UNIT-IV

Specialized Linear IC Applications: 555 timer IC (monostable & astable operation) & its applications, Universal active filter, Switched capacitor filter, Power amplifier, IC-8038: Block diagram, Pin diagram & its applications as function generator, PLL: Operating principle, IC – 565 & its application as frequency multiplier, Frequency translation, AM, FM & FSK Demodulator.

Text Books:

1. R.A. Gayakwad, Op-amps and Linear Integrated Circuits, Pearson Ed.
2. D.Roy Choudhray, Linear Integrated circuits; New Age International (P)Ltd.

NUMERICAL METHODS & LINEAR PROGRAMMING
(Open elective)
MATH-OE1

L	T	Cr	On Semester Evaluation : 100 Marks
3	1	4	End Semester Evaluation : 100 Marks

Time: 3 hrs **Marks:100**

Note: 1. There are nine questions in a set of question paper. All questions will carry equal marks.

2. The students are required to attempt five questions in all selecting at least one from each unit and First question is compulsory.

UNIT-I

Numerical Solution of Algebraic & Transcendental equations: Bisection Method, Regula-Falsi Method, Secant Method, Fixed –Point iteration Method , Newton-Raphson Method and their convergence , Condition of convergence of Newton-Raphson Method.

Solution of Simultaneous Equations: Crout'sTriangularisation Method, Jacobi's Iteration Method, Gauss Seidal Iteration Method, Gauss elimination Method and Gauss Jordan Method

UNIT-II

Finite Differences: Newton forward difference formula (without proof), Newton backward difference formula (without proof), Numerical Differentiation, Numerical Integration, Newton cote's quadrature formula, Trapezodial rule, Simpson $1/3^{rd}$ rule, Simpson 3/8 rule.

UNIT - III

Numerical Solution of Differential Equations: Picard's Method, Taylor Series Method, Euler's Method, Modified Euler Method, Runge-Kutte Method, Predictor Corrector meyhod, Method of least squares.

UNIT-IV

Linear Programming: Formulation of Linear Programming problems, standard and canonical form of a Linear Programming Problem, Basic solution, Degeneracy, Non-degeneracy, Solution of Linear Programming Problem using Graphical Method, Simplex Method and Dual-Simplex method, Basic Duality Principle.

Text Books:

1. Higher Engineering Mathematics : B. S. Grewal, Khanna Publishers.
2. Ramana, B.V., "Higher Engineering Mathematics" Tata McGraw-Hill.
3. Numerical Methods for Scientific & Engineering Computation : M.K. , Jain, R.K. Jain, S.R.K. Iyengar, New Age Publications
4. Advanced Engineering Mathematics: E. Kreyzig, John Wiley and Sons.
5. Mathur A. B., Jaggi V. P., "Advanced Engineering Mathematics", Khanna Publishers.
6. Babu Ram, "Engineering Mathematics", Pearson Education

Reference Books:

1. Mitin, V. V., Polis, M. P. and Romanov, D. A., "Modern Advanced Mathematics for Engineers", John Wiley and Sons, 2001.
2. Numerical Mathematical Analysis: James B. Scarborough, Oxford and IBH Publishing Co. Pvt. Ltd.
3. Jain, R. K. and Iyengar, S. R. K. "Advanced Engineering Mathematics", Narosa Publication, 2003 (2^{nd} Ed.)
4. Introductory Method of Numerical Analysis : S.S. Sastry; Prentice Hall of India
5. Operation Research : H.A. Taha, Dorling Kindersley India Pvt. Ltd.

B.TECH IV SEMESTER
MEASURING INSTRUMENTS AND TRANSDUCERS
(EC-242)

L	T	Cr	On Semester Evaluation:100 Marks
3	1	4	End Semester Evaluation: 100 Marks

Time: 3 hrs

Marks:100

NOTE: There shall be nine questions. Question No. 1 is compulsory and will have four parts a, b, c, d covering entire syllabus. There shall be two questions from each unit and students have to attempt One question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

UNIT-I

Measurement and Error: Functional elements and generalized configuration of a measuring instrument, Types of instruments, Characteristics of instruments, Types of errors, Error in measurement.

Measurement Of Resistance: Wheatstone bridge, Carey Foster Bridge, Kelvin Double Bridge, Measurement of insulation resistance by 2-wire, 3-wire method and using MEGGER.

UNIT-II

A.C. Bridges: Maxwell Inductance Bridge, Maxwell Inductance Capacitance Bridge, Anderson bridge Hay Bridge, Desauty Bridge, Schering Bridge, Wein Bridge, Owen Bridge with phasor diagram.

Voltage Indicating and Recording Devices: PMMC instruments, moving iron instruments Hot wire instruments, CRO: CRT, Focusing mechanism, Block diagram of CRO, Lisssajous pattern

Recorders: Strip chart recorder, X-Y recorder, Magnetic Tape recorders, Digital tape recorders.

UNIT-III

Digital Instruments: Digital indicating instruments, Comparison with analog type, Digital method of time and frequency measurement

Types Of Digital Voltmeters: Ramp type, Dual slope, Potentiometer type, Successive Approximation DVM.

Data Acquisition System: Block diagram of analog and digital data acquisition system,

Telemetry System—Land Line and R.F. telemetry

UNIT-IV

Transducers: Classification of transducers, Characteristics and choice of transducer, Strain gauge, Types of strain gauge (unbounded metal strain, bounded metal wire strain gauge, semiconductor strain), Displacement transducers: capacitance transducers and LVDT, Piezoelectric transducers, Temperature Transducers-Thermistors, Thermometers (resistive and semiconductor), Thermocouples. Radiation Pyrometers

Measurement Of Non-Electrical Quantities: Low-pressure (Vacuum) measurement, Liquid level measurement.

TEXT BOOK:

1. A course in Electrical and Electronics Measurements and Instrumentation: A.K. Sawhney; Dhanpat Rai.

REFERENCE BOOKS:

1. Doeblin E.O., Measurement Systems: Application and design, McGraw Hill.
2. Electronics Instrumentation and Measurement Techniques: Cooper W.D and Helfrick A.D.

B.TECH IV SEMESTER
ANALOG COMMUNICATION
(EC-241)

L	T	Cr	On Semester Evaluation:100 Marks
3	1	4	End Semester Evaluation: 100 Marks

Time: 3 hrs **Marks:100**

NOTE: There shall be nine questions. Question No. 1 is compulsory and will have four parts a, b, c, d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

UNIT – I

Noise: Classification of Noise, Various sources of Noise, Methods of Noise Calculation in networks, Addition of noise due to several sources, Addition of noise due to several amplifiers in cascade, noise in reactive circuits, Noise figure, its calculation and measurement, Noise figure for cascaded stages, Noise temperature, Noise Temperature for cascaded stages, Narrow band noise and its representation, Equivalent noise bandwidth.

UNIT-II

Modulation Techniques: Basic constituents of Communication Systems, Need of modulation. Amplitude modulation, Spectrum of AM wave, Modulation index, Power relations in AM wave, Generation of AM-Collector modulation, Square law modulation, Detection of AM Signal – Square Law Detector, Diode detector, DSBSC generation and its detection, SSB Generation and its detection, Vestigial side band modulation, Calculation of figure of merit for various AM systems, FDM.

UNIT-III

Angle Modulation: Frequency and Phase modulation, Spectrum of FM Wave, Modulation index and Bandwidth of FM Signal, Relation between FM and PM, NBFM and WBFM, Comparison between FM and PM Signals, FM and AM signals, AM and NBFM Signals, FM generation methods –Direct and Indirect Methods, FM Demodulation methods- Slope detector, Ratio detector, Foster-Seeley Detector, Pre-emphasis & De-emphasis, Effect of noise on carrier, Noise triangle.

UNIT-IV

Transmiter and Receiver: Classification of radio transmitters, Block diagram of AM transmitter, Frequency Scintillation, Frequency drift, Radio broadcast transmitter, Radio telephone transmitter, Privacy devices, Armstrong FM transmitter, Simple FM transmitter using Reactance modulator, Classification of radio receivers, TRF receives, Superheterodyne receivers, Image Signal rejection, frequency mixers, Tracking and alignment of receivers, Intermediate frequency Amplifier, AGC, AFC.

Reference Books:

1. **Chakrabarti P., Analog Communication Systems, Dhanpat Rai & Co. .**
2. **Mithal G K, Radio Engineering, Khanna Pub.**
3. **Haykin Simon, Communication Systems, John Wiley.**
4. **Kennedy G. & Davis B., Electronics Communication System, TMH**
5. **Singh R.P. & Sapre S.D.,Communication Systems (Analog & Digital), TMH**

B.TECH IV SEMESTER

POWER ELECTRONICS
(EC-24E1)

L	T	Cr	On Semester Evaluation:100 Marks
3	1	4	End Semester Evaluation: 100 Marks
Time: 3 hrs			Marks:100

NOTE: There shall be nine questions. Question No. 1 is compulsory and will have four parts a, b, c, d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks**.** Question paper should have 25 % numerical part.

UNIT – I

Introduction: Concept of Power Electronics, Power Electronics Systems, Applications of Power Electronics, Advantages and disadvantages of power electronics devices, Various types of power semiconductor devices.

Power Semiconductor Diodes and Transistors: Power Diode, Types of Power Diodes, Characteristics of Power Diodes (V-I Characteristics and Reverse Recovery Characteristics), Power Transistors, Power MOSFETs (MOSFET Characteristics & Comparison of MOSFETs with BJTs), Insulated Gate Bipolar Transistor (Basic Structure and Working, IGBT Characteristics, Switching Characteristics, Applications of IGBT).

UNIT – II

Thyristors: Thyristors, Static V-I Characteristics of Thyristors, Switching characteristics of Thyristors, Two transistor model of Thyristor, Thyristor protection: Snubber Circuit, Over voltage protection, Gate protection. Serial and parallel operation of Thyristors, Firing circuit for Thyristor: RC Firing circuit, UJT Firing circuit. Thyristor commutation techniques: Class A, Class B, Class C, Class D, Class E and Class F

Phase Controlled Rectifiers: Principle of phase control, Full wave Controlled rectifiers, Single phase and full wave converters using diodes and SCRs, Dual converters, Effect of source impedance on the performance of converters (only for single phase).

UNIT – III

Choppers: Principle of operation, Control strategies, Step up choppers, Types of choppers: Type A, Type B, Type C, Type D and Type E choppers, Voltage commutated chopper, Load commutated chopper, Multiphase choppers.

Inverters: Principle of operation of inverter, serial and parallel single-phase inverters, voltage control in single-phase inverters, Reduction of harmonics in inverters output voltage, Modified Mcmurray half bridge and full bridge inverters.

UNIT-IV

Cycloconverters: Principle of cycloconverter operation, Single phase to single-phase circuit, Step up cycloconverter, Midpoint and Bridge type cycloconverters. Three phase half wave cycloconverter: Three phase to single phase and three phase to three phase cycloconverters.

Text Books:

1. Power Electronics: P.S. Bimbhra; Khanna.
2. Power Electronics: P.C.Sen.

B.TECH III SEMESTER
FIELDS AND WAVES
(EC-243)

L	T	Cr	
3	2	4	

On Semester Evaluation:100 Marks
End Semester Evaluation: 100 Marks

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Time: 3 hrs **Marks:100**

NOTE:

There shall be nine questions. Question No. 1 is compulsory and will have four parts a,b,c,d covering the entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions carry equal marks. Question paper should have 25 % numerical part.

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UNIT-I

Electric Field and Current: ***Vector analysis, Vector operator : Gradient, Divergence and Curl, Coordinate systems : Rectangular, Cylindrical and Spherical Coordinates, Introduction to Stoke's Theorem and Gauss's Divergence Theorem***

Coulomb's law of Electrostatics, Electric field intensity, Field due to a continuous volume charge distribution, Field due to a line charge, Field due to a sheet of charge, Electric flux density, Electric potential and potential difference, Work done in Electric field, Gauss's law and applications, Electric dipole, Current density, Continuity of current, Metallic conductors, Conductor properties and boundary conditions, Method of images, Nature of dielectric materials, Boundary conditions for perfect dielectric materials, Capacitance of a two wire line, Electrostatic energy, Poisson's equation, Laplace's equation & its solution, Uniqueness theorem.

UNIT-II

Magnetic Field And Maxwell's Equations: ***Faraday's law of electromagnetic induction, Lorentz force, Biot-Savart's law, Magnetic field of a linear conductor, Magnetic field of a circular loop, Ampere's circuital law and its applications, Magnetic vector potentials, Force and torque on a closed circuit, Magnetic susceptibility, Magnetic boundary conditions, Magnetic circuit, Potential energy and forces on magnetic materials, Energy stored in magnetic field.***

Displacement current density, Maxwell's equations in point & integral form, Physical interpretation of Maxwell's equations, Maxwell's equations for harmonic fields, Retarded vector potentials.

UNIT-III

The Uniform Plane Wave: ***Wave equations, Uniform plane waves and their properties, Wave propagation in perfect dielectric medium and conducting medium, Conductors & dielectrics, Intrinsic impedance, Skin depth, Poynting vector and power considerations, Electromagnetic wave polarization, Reflection of uniform plane waves at normal & oblique incidence, SWR.***

UNIT-IV

Transmission Lines and Waveguides: Transmission line principle & equations, Input impedance, voltage & current in a transmission line, Infinite transmission line, Characteristic impedance, Propagation constant, Phase velocity, Group velocity, Open-circuited and short-circuited transmission lines, Impedance matching, Stub matching, Smith chart.

TE, TM & TEM waves, TE and TM modes in the rectangular waveguides, Cut-off wavelength and guide wavelength,Cut-off frequency, Propagation constant, Wave impedance and characteristic impedance, Dominant modes, Power flow in waveguides.

Text Books :

1. Prasad K D, Antenna & Wave Propagation, Satya Prakashan.
2. Hayt W H, Jr., Engineering Electromagnetics, Tata McGraw Hill.

Reference Books :

1. Jordan E C & Balmain K G, Electromagnetic Waves and Radiating Systems, PHI.
2. David K. Chang, Field and Waves Electromagnetics, Addison Wesley.
3. Samuel Y. Liao, Microwave Devices and Circuits, Pearson Education.

B.TECH IV SEMESTER
MICROELECTRONICS ENGINEERING
(EC-245)

L	T	Cr	On Semester Evaluation:100 Marks
3	1	4	End Semester Evaluation: 100 Marks
Time: 3 hrs			Marks:100

NOTE: There shall be nine questions in total. The question No.1 is compulsory and will have four parts a, b ,c ,d covering entire syllabus. There shall be two questions from each unit and students have to attempt one question from each unit. All questions will carry equal marks. Question paper should have 25 % numerical part.

UNIT- I

Crystal Growth: Introduction, EGS, Czochralspi Crystal Growing, Silicon Shaping, Wafer Preparation.

Oxidation: Introduction, Growth Mechanism and Kinetics, Oxidation Techniques & Systems, Oxide Properties.

Thin Film Deposition Methods: Vacuum Evaporation, Sputter Deposition, Chemical Vapour Deposition, Epitaxy: 'Introduction, VPE, MBE and Epitaxial Layer Evaluation'.

UNIT – II

Lithography: Introduction, Optical Lithography, Electron Beam Lithography, X-ray Lithography, Ion Lithography.

Reactive Plasma Etching: Introduction, Plasma Properties, Isotropic Etching and Anisotropic Etching, Plasma Etching Techniques and Equipments.

UNIT-III

Diffusion: Introduction, Diffusion Mechanisms, Fick's One Dimensional Diffusion Equation, Atomic Diffusion Mechanisms, Diffusion in Polycrystalline Silicon, Diffusion in SiO_2 and Characterization of Diffused Layers.

Ion Implantation: Introduction, Range Theory, Ion Implantation Equipment and Systems, Annealing.

UNIT-IV

VLSI Process Integration: Introduction, Fundamentals Considerations for IC Processing, NMOS & CMOS IC Fabrication Process Sequence, MOS Memory IC Technology.

Assembly & Packaging: Introduction, Package Types, Design Considerations, Assembly Technology, Package Fabrication Technology and MEMS Packaging.

Reference Books:

1. S.M.Sze, "VLSI Technology", McGraw Hill.
2. S.K.Gandhi, "VLSI Fabrication Principles".

B.TECH IV SEMESTER
ANALOG COMMUNICATION LAB
(EC-24P1)

P	Cr	
2	1	**On Semester Examination : 120 Marks**
		End Semester Examination: 80 Marks

LIST OF EXPERIMENTS:

1. To perform Amplitude Modulation and determine its modulation index and power in sidebands.
2. To perform amplitude demodulation by linear diode detector.
3. To perform Double Side Band Suppressed Carrier using Balanced Modulator.
4. To perform Single Side Band Suppressed Carrier Modulation.
5. To perform Frequency Modulation and determine its modulation index.
6. To perform Sampling.
7. To Study Super heterodyne Receiver and verify the Sensitivity, Selectivity and Fidelity characteristics of super heterodyne receiver.
8. To perform Pulse Width Modulation / Demodulation.
9. To perform Pulse Position Modulation / Demodulation.
10. To verify the operation of active filters (Low-pass, High-pass, Band-pass, Notch filter).

B.TECH IV SEMESTER

LINEAR INTEGRATED CIRCUITS & APPLICATIONS LAB
(EC-24P3)

P	Cr	
4	1	**On Semester Examination : 120 Marks**
		End Semester Examination: 80 Marks

LIST OF EXPERIMENTS:

1. **To study Op-amp as adder and subtractor circuits using IC-741.**
2. **To study clipping circuits and clamping circuits using Op-amp(IC-741).**
3. **To study a phase shift oscillator using Op-amp (IC-741).**
4. **To study astable multivibrator circuit using timer IC-555.**
5. **To study monostable multivibrator circuit using timer IC-555.**
6. **To study op-amp as a square wave generator using IC-741 .**
7. **To study op-amp as a triangular wave generator using IC-741.**
8. **To design 2^{nd} order low pass butterworth filter.**
9. **To design 2^{nd} order high pass butterworth filter.**
10. **To study op-amp as a differentiator and integrator using IC-741.**
11. **To design unity gain universal active filter.**
12. **To design an analog to digital converter using IC-741.**

NOTE: At least 10 experiments are to be performed from above list.

B.TECH IV SEMESTER
MEASURING INSTRUMENTS AND TRANSDUCERS LAB
(EC-24P2)

P	Cr	
2	1	**On Semester Examination : 120 Marks**
		End Semester Examination: 80 Marks

LIST OF EXPERIMENTS

1. Measurement of unknown inductance in terms of capacitance and resistance by using Maxwell's Inductance Bridge.
2. Measurement of unknown inductance by using Hay's Bridge.
3. Measurement of unknown capacitance of small capacitors by using Schering's Bridge.
4. Measurement of 3-phase power with Two-Wattmeter method for Balanced and Unbalanced Bridge.
5. Measurement of unknown capacitance using De-Sauty's Bridge.
6. Measurement of unknown frequency using Wein's frequency Bridge.
7. Measurement of unknown low resistance using Kelvin's Double Bridge.
8. Testing of the soil resistance using Megger(Ohmmeter).
9. Calibration of Energy Meter using standard Energy Meter.
10. To plot the B-H curve of different magnetic materials.
11. Calibration of AC Voltmeter and AC Ammeter Using Potentiometer.

Note: At least ten experiments are to be performed from above list.