SWAMI RAMANAND TEERTH MARATHWADA UNIVERSITY, NANDED
TEACHING AND EXAMINATION SCHEME
Second Year (Electronics/ Electronics and Telecommunication Engineering)
(With effect from A.Y. 2015-16)

Semester - III

Subject Code	Subject	Teaching Scheme		Examination Scheme (Marks)				
		Hrs/Week	Credits	Paper	Test	TW	PR	Total
1	Engineering Math –III	4	4	80	20			100
2	Electronic Devices and Circuits-I	4	4	80	20			100
3	Network Theory	4	4	80	20			100
4	Digital Logic Design	4	4	80	20			100
5	Professional Communication	2	2	40	10			50
6	Numerical Analysis and Computation	2	2	40	10			50
7	Electronics devices and Circuit-I Laboratory	2	1			25	25	50
8	Numerical Analysis and Computation Lab	2	1			25	25	50
9	Professional Communication Practice	2	Audit			25	25	50
10	Digital Logic Design Laboratory	2	1			25	25	50
11	Electronics Workshop	2	1			25	25	50
	Total	30	24	400	100	125	125	750

Semester - IV

Subject Code	Subject	Teaching Scheme		Examination Scheme (Marks)				
		Hrs/Week	Credits	Paper	Test	TW	PR	Total
1	Engineering Math-IV	4	4	80	20			100
2	Electronic Devices and Circuits-II	4	4	80	20			100
3	Analog Communication System	4	4	80	20			100
4	Signals & Systems	4	4	80	20			100
5	Microprocessor and Interfacing	4	4	80	20			100
6	Object Oriented Programming	2	2	40	10			50
7	Electronic Devices and Circuits-II Lab	2	1			25	25	50
8	Analog Communication Lab	2	1			25	25	50
9	Programming Skills Laboratory	2	1			25	25	50
10	Microprocessor and Interfacing Lab	2	1			25	25	50
	Total	30	26	440	110	100	100	750

Dr.S.S. Gajre
BOS Member

Dr. S.K.Chidrawar
BOS Member

Dr.B.M.Patre
BOS Chairman

Engineering Mathematics – III

Theory Examination 3 Hours, 80 Marks **Test: 20 Marks**

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Unit-I Curve Tracing **(07 Hrs)**

Introduction, Curve tracing in Cartesian coordinates & Polar coordinates, special curves.

Unit-II Linear Differential Equation of Higher order **(08 Hrs)**

Introduction to Linear Differential Equation of n^{th} order with constant coefficients
Methods of solving Linear Differential Equation with constant coefficients

a) Shortcut Methods
b) Method of variation of parameters

Equation reducible to Linear Differential Equation with constant coefficients

a) Cauchy's Equation
b) Legendre's Equation

Application of Linear Differential Equations to Electrical Circuits.

Unit-III Laplace Transform **(08 Hrs)**

Definition, Existence of Laplace Transform, Laplace Transform of standard functions,
Properties with proof and examples: Linearity, Change of scale, First shifting, Second shifting, Multiplication by t^n, Division by t., L.T. of derivative and Integral, Evaluation of real Integrals using Laplace Transform. Inverse Laplace Transform: Using Standard properties, Partial fraction, Convolution Theorem.

Unit-IV Laplace Transform of Special function and Applications **(07 Hrs)**

Unit (Heaviside) step function, Unit Impulse (Dirac Delta) function, Periodic function Application of L.T. to initial value problems, partial differential equations

Unit-V Vector Differentiation **(07 Hrs)**

Vector and Scalar point functions, Differentiation of vector point function, vector differential operator, gradient of scalar point function, directional derivatives,angle between two surfaces, divergence of vector point function, solenoidal vector field, irrotational and conservative field, second order differential operator and vector identities (only problems)

Unit-VI Vector Integration **(08 Hrs)**

Line integral in Cartesian, polar and parametric form, work done, line integral is independent of path, Green's theorem (without proof), its verification and application, surface integral, Stoke's theorem (without proof) and applications, volume integral, Gauss divergence theorems (without proof), and applications.

Books:

1. B.S.Grewal, *Higher Engineering Mathematics*, 43rd Edition, Khanna Publishers.
2. William E. Boyce, Richard C.DiPrima, *Elementary Differential Equations and Boundary Value Problems*, (9th Edition)
3. R. K. Jain and S.R.K.Iyenger, *Advanced engineering Mathematics*, 3rd Edition, Narosa Pub. House, New Delhi.
4. Thomas and Finney, Calculus, 9th Edition, Pearson Education, Delhi.

Reference Book:

1. E. Kreszig, *Advanced Engineering Mathematics*, 6th edition, Wiley Eastern publication.
2. H. K. Dass, *Advanced Engineering Mathematics,* S. Chand & Company Ltd., New Delhi.
3. B.V. Ramana, *Higher Engineering Mathematics*, Tata McGraw Hill, Publication.
4. P.N. Wartikar and J.N. Wartikar, *Applied Mathematics* (Volumes I and II), Pune vidyarthi Griha Prakashan, Pune.

Electronic Devices and Circuits- I

Theory Examination 3 Hours, 80 Marks **Test: 20 Marks**

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UNIT–I] Semiconductor Diode and Diode circuits: **[7 Hours]**

Conductivity modulation, Einstein equation, Continuity equation, Diffusion current and Law of Mass action, Hall Effect, Junction diode Switching time, Diode as a circuit element, load line concept; Analysis and design of capacitive filter, inductive filter, L-C & C-L-C Filters; Clamper circuits, clipper circuits, Voltage doublers.

UNIT–II] Transistor biasing: **[7 Hours]**

The early effect, Transistor as a switch, typical Transistor junction voltages, Transistor as an amplifier, Operating point, bias stability; Design of Fixed biasing, collector to base biasing and voltage divider biasing circuits; Stabilization against variation in $V_{BE,}$ Ico and β for the self bias circuit, Bias compensation, Thermistor and Sensistor compensation, Thermal run away.

UNIT–III] Small Signal low frequency Transistor Model: [**6 Hours]**

Transistor hybrid model, h-parameters, Analysis of transistor amplifier circuits using h-parameters. Linear analysis, physical model of CB transistor; Cascaded transistor amplifier; Simplified Hybrid models-CB, CE, CC; Common emitter amplifier with an emitter resistance, emitter follower, Miller's theorem and it's dual, High input resistance transistor circuits, Design of single stage CE amplifier.

UNIT–IV] Feedback amplifier and amplifier design: **[6 Hours]**

Classification of amplifiers, Feedback concept, Transfer gain with feed back, General characteristics of feed back amplifier, Input and output resistance, Method of analysis of feedback amplifier, Design of feedback amplifier; Voltage series, current series, voltage shunt and current shunt amplifiers.

UNIT–V] Oscillators: **[6 Hours]**

Theory of sinusoidal oscillations, Barkhausen criterion, Phase shift oscillator, Colpitts oscillator, Hartley oscillator, Wien bridge oscillator, crystal oscillator; Design of above all types of oscillators.

UNIT–VI] Field effect transistors: **[8 Hours]**

An overview of JFET and MOSFET: pinch off voltage, pinch region formation, transfer characteristic, Threshold voltage, Transconductance; FET small signal model, low frequency common source and common drain amplifiers, Biasing arrangement of JFET, Biasing for zero drift current, Design of CS and CD FET amplifiers; and device capacitance; MOSFET –Enhancement type and Depletion type and it's biasing.

Text Books:

01. Millman's Electronic Devices and Circuits by Millman Halkias &, Satyabratajit(2nd edition, McGraw Hill Publications)
02. Integrated Electronics by Milliman and C.C. Halkias(Tata McGraw hill Publications)
03. Electronic Devices and Circuit Theory by Robert L. Boylestad (PHI Publications)

Reference Books:

01. Electronic Devices and circuits by Bogart Beasley Rico (LPE Publications)
02. Principle of Electronic Devices and circuit by Malvino Leach (Tata McGraw hill)

03. Electronic Devices and Circuits by David A. Bell (PHI Publications)

Network Theory

Theory Examination 3 Hours, 80 Marks **Test: 20 Marks**

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UNIT-I] ANALYSIS OF ELECTRICAL CIRCUITS [12 Hours]

Analysis of AC & DC circuits: Analysis of circuits, Mesh and nodel analysis.

Superposition, Thevenin, Norton, Maximum power, Reciprocity theorems.

Analysis of coupled circuits: Self and mutual inductances, coefficient of coupling, Dot convention, equivalent circuit.

Series and parallel resonance circuits: Selectivity, bandwidth, quality factor.

UNIT-II] FILTERS AND ATTENUATORS [4 Hours]

Basic filter circuits: Low pass, high pass, band pass and band stop filters, transfer function, frequency response, cutoff frequency, bandwidth, quality factor, attenuation constant, phase shift, characteristic impedance.

Concept of design and analysis of filters: Constant K, M derived and composite filters.

UNIT-III]: Network Analysis [8 Hours]

Time domain analysis of R-L, R-C, L-C and R-L-C Circuits: Forced and natural response, time constant, initial conditions in network.

Solution using second order equation for standard input signals: Transient and steady state response, s-domain representation, applications of Laplace Transform in solving electrical networks, waveform synthesis, driving point and transfer function, Poles and Zeros,.

UNIT-IV] TWO PORT NETWORKS [4 Hours]

Parameters: Open Circuit, Short Circuit, Transmission and Hybrid parameters, relationships among parameters.

UNIT-V] Synthesis of One port network with two and three kinds of element. [8 Hours]

Positive real functions: Concept of positive real function, testing for Hurwitz polynomials, testing for necessary and sufficient conditions for positive real function

Synthesis of RC, RL, LC circuits: Synthesis of RC, RL, LC and RLC driving point functions.

UNIT-VI] Filter Design [4 Hours]

Low pass filter approximations: Butterworth and Chebyshev type – I approximations,

References:

1. Franklin F Kuo,'Network Analysis & Synthesis', John Wiley & Sons.
2. M E Vanvelkenberg, 'Network Analysis', PHI.
3. A Chakrabarti, 'Circuit Theory', Dhanpat Rai & Co.
4. Umesh Sinha, 'Network Analysis', PHI.
5. Sudhakar & Sham Mohan, 'Circuits & Synthesis'
6. Johny Johnson, 'Introduction to DSP', PHI.

DIGITAL LOGIC DESIGN

Theory Examination 3 Hours, 80 Marks **Test: 20 Marks**

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Unit I: Digital Logic Families 7 Hrs

Classification of logic families, Characteristics of digital ICs-Speed of operation,power dissipation, figure of merit, fan in, fan out, current and voltage parameters, noise immunity, operating temperatures and power supply requirements. TTL logic. Operation of TTL NAND gate, active pull up, wired AND, open collector output,unconnected inputs. Tri-State logic. CMOS logic –CMOS inverter, NAND,
NOR gates, unconnected inputs, wired logic , open drain output. Interfacing CMOS and TTL. Comparison table of Characteristics of TTL, CMOS, ECL, RTL, I2L, DCTL.

Unit II : Combinational Logic Design **7** Hrs

Standard representations for logic functions, k map representation of logic functions (SOP m POS forms), minimization of logical functions for min-terms and max-terms (upto 4 variables), don't care conditions, Design Examples: Arithmetic Circuits, BCD -to – 7 segment decoder, Code converters. Adders and their use as subtractions, look ahead carry, ALU, Digital Comparator, Parity generators/checkers, Multiplexers and their use in combinational logic designs, multiplexer trees, Demultiplexers and their use in combinational logic designs, Decoders, demultiplexer trees. Introduction to Quine McCluskey method.

Unit III : Sequential Logic Design 8 Hrs

1 Bit Memory Cell, Clocked SR, JK, MS J-K flip flop, D and T flip-flops. Use of preset and clear terminals, Excitation Table for flip flops. Conversion of flip flops. Application of Flip flops: Registers, Shift registers, Counters (ring counters, twisted ringcounters), Sequence Generators, ripple counters, up/down counters, synchronous counters,lock out, Clock Skew, Clock jitter. Effect on synchronous designs.

Unit IV : State Machines **6** Hrs

Basic design steps-State diagram, State table, State reduction, State assignment, Mealy and Moore machines representation, Implementation, finite state machine implementation, Sequence detector.

Unit V : Programmable Logic Devices and Semiconductor Memories- 6 Hrs

Programmable logic devices: Detail architecture, Study of PROM, PAL, PLA, Designing combinational circuits usingPLDs.General Architecture of FPGA and CPLD
Semiconductor memories: memory organization and operation, expanding memory size, Classification and characteristics of memories, RAM, ROM, EPROM, EEPROM, NVRAM, SRAM,DRAM,

Unit VI : Introduction to HDLs 6 Hrs

Library, Entity, Architecture, Modeling styles, Data objects, Concurrent and sequential statements, Design examples, using VHDL for basic combinational and sequential circuits, Attributes (required for practical) (Test benches and FSM excluded).

Text Books :

1.R.P. Jain , "Moderndigital electronics" , 3rd edition , 12th reprint TMH Publication, 2007.
2.Stephen Brown, "Fundamentals of digital logic design with VHDL" 1stedition, TMH Publication 2002

Reference Books :

1.A. Anand Kumar, "Fundamentals of digital circuits" 1stedition, PHI publication, 2001
2.Wakerly Pearon, "Digital Design: Principles and Practices", 3rdedition, 4threprint, Pearon Education, 2004
3.J. Bhaskar, "VHDL Primer" 3rd Edition.PHI Publication.
4.Mark Bach, "Complete Digital Design", Tata MCGraw Hill, 2005.
5.Volnei Pedroni, " Digital: Electronics and Design with VHDL", Elsevier

Professional Communication

Theory Examination 2 Hours, 40 Marks **Test: 10 Marks**

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Unit I Fundamentals of Professional Communication (**04 Hrs)**

- Definition of Communication Elements of Communication (Sender, Receiver & Media)
- Communication Process/ Cycle
- Types of Communication (Verbal- Oral & Written, Non-verbal- Body Language, Sign Language & Paralanguage)
- Patterns of Communication in Organization (Internal, External, Upward, Downward, Horizontal, Diagonal, Grapevine)
- Barriers of Communication (Physical, Mechanical, Language, Psychological, Linguistic, Cultural)
- 7 C's of effective Communication

Unit II Speaking Skills **(04 Hrs)**

Presentation Skills

- Public Speaking
- Group Discussion
- Interview Skills

Unit III Writing Skills **(04Hrs)**

Business Correspondence

- Elements/ Parts of Business Letters
- Formats: Full Block, Semi Block
- Job Application, Demand Letter, Letter of Complaint, & Letter of Claim
- Resume Preparation
- Comprehension
- E-mail: Nature, Purpose, Advantages, Characteristics of Successful E-mail messages & E-mail format
- Reports: Meaning, Significance, Essential Features of a good Report & Types of Report

Unit IV Phonetics **(04 Hrs)**

- Study of Speech Organs
- List of Phonetic Alphabets
- Manner of Articulation of 44 Sounds
- Word Transcription

Unit V Introduction to Behaviourial Skills (02Hrs)

- Developing Positive Attitude
- Time Management
- Stress Management

Unit VI Vocabulary (02 Hrs)

- Synonyms
- Antonyms
- One word substitution

Text Books:

1. Business Communication by Sangeeta Magan, Biztantra, New Delhi.ISBN: 8177228285
2. Soft Skills for Managers by Dr. T. Kalyana Chakravarthi & Dr. T. Latha Chakravarthi, Biztantra, New Delhi. ISBN 10: 8177225685
3. English Grammar and Composition by Rajendra Pal and Prem Lata Suri, Sultan Chanda and Sons Publisher. ISBN: 978-81-8054-868-0

Reference Books:

1. Behavioural Science by Dr. Abha Singh, Wiley India Pvt. Ltd. ISBN: 9788126538027
2. Soft Skills for Everyone by Jeff Butterfield, Cengage. ISBN: 9788131514672
3. Essentials of Business Communication - Rajendra Pal and J. S. Korlhalli Sultan Chand & Sons, New Delhi. ISBN: 8180547299
2. Essential Communication Skills by Shalini Aggarwal, Ane Books Pvt. Ltd, New Delhi. ISBN: 978-8180522802
5. Spoken English: A Manual of Speech and Phonetics by R.K. Bansal & J.B. Harrison, Orient Blackswan Pvt. Ltd, Hyderabad. ISBN: 978- 8125050858
6. Ace of Soft Skills by Gopalswami Ramesh, Mahadevan Ramesh, Pearson Publication, Delhi. ISBN: 9788131732854
7. Effective Technical Communication by M. Ashraf Rizvi, McGraw Hill Education Pvt. Ltd. Delhi. ISBN: 978-00-7059-952-9

Numerical Analysis and Computation

Theory Examination 2 Hours , 40 Marks **Test: 10 Marks**

UNIT-I] Roots of Equation: **[07 Hours]**

Significant figures, Accuracy &precision, Error definitions, Round off errors, Truncation errors, Error Approximations, Total numerical errors; Bracketing Methods: Graphical methods, Bisection method, False position method; Open methods: simple one point iteration method, Newton- Raphson method, Secant method, multiple roots; Case Study: Design of Electric circuit and General Engineering Problems.

UNIT-II] Linear Algebraic Equations and systems: **[07 Hours]**

Introduction to vectors and matrices, Types of Matrices, Properties, Gauss elimination method, Pitfalls of Gauss elimination, Techniques for improving solutions, Gauss-Jordan and Gauss-Seidal methods, Matrix inverse and LU decomposition method; Case Study: Currents and voltages in resistor circuits.

UNIT –III] Curve fitting-Least Squares Regression: **[06 Hours]**

Regression: Linear regression, Polynomial regression, Multiple linear regression**;** Interpolation: Newton's divided difference-interpolating polynomials, Lagrange interpolation polynomials ,Spline interpolation: Linear splines, Quadratic splines and Cubic splines.

Course Outcomes:

1. Enhancement in the problem solving skills of the students.
2. An effective learning of mathematics and computer programming.
3. Students will be able to handle large system of equations, nonlinearities, and complicated geometries with the help of computer programming.

Text Books:

1. "Numerical Methods for Engineers", 5th edition by Steven C. Chapra,(McGraw Hill Book Company).**ISBN-13: 978-0071244299**
2. Introductory Methods of Numerical Analysis, 4th edition by S. S. Sastry , (PHI Publication).**ISBN-13: 9788120345928**
3. Numerical Methods for mathematics science and engineering, 2nd Edition by John H. Mathews (PHI Publication).**ISBN 0-13-065248-2**

Reference Books:

1. Numerical Methods by P. Kandasamy, K. Thilagavathy and K. Gunavathi, (S.CHAND Publication). **ISBN**: **978812191438.**

Electronic Devices and circuits Laboratory–I

Term Work: 25 Marks **Practical Examination: 3 Hours, 25 marks**

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LIST OF EXPERIMENTS:

01. Design of Capacitor Filter.
02. Clipper circuits using diode.
03. Design and Comparison of biasing circuits.
04. To determine Ro, Ri, Av, Ai for CE amplifier
05. Design of single stage CE amplifier and study Frequency response.
06. Transistorized R -C phase shift Oscillator.
07. Design of transistorized Colpitts oscillator.
08. Voltage series, current series feedback amplifier
09. Voltage shunt and current shunt feedback amplifiers.
10 V –I characteristic and transfer curve for JFET.

Note: Minimum eight experiments from above list. Experiment No. 1 2,3,,and 6 implemented using multisim or electronic workbench simulation software.

Numerical Analysis and Computation Lab

Term Work: 25 Marks **Practical Examination: 3 Hours, 25 marks**

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List of Experiments

1. Write a program to implement Bisection method using C language
2. Write a program to implement False Position method using C language
3. Write a program to implement Simple one point iteration method using C language
4. Write a program to implement Newton-Raphson method using C language
5. Write a program to implement Secant method using C language
6. Write a program to implement Gauss elimination method using C language
7. Write a program to implement Gauss Seidal method using C language
8. Write a program to implement Linear regression method using C language
9. Write a program to implement Newton's divided difference interpolating polynomials method using C language
10. Write a program to implement Lagrange interpolation polynomials method using C language

PROFESSIONAL COMMUNICATION PRACTICE

Term Work: 25 Marks **Practical Examination: 25 Marks**

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Term Work

1. Communication Cycle/Process
2. Self Introduction
3. Extempore
4. Role Play
5. Listening Phonetic Sounds' Manner of Articulation in Language Laboratory
6. Group Discussion
7. Mock Interview
8. Application Writing
9. Email Writing
10. Resume Writing
11. Vocabulary Based Activity
12. PPT Presentation on Non-Technical Issue

Digital Logic Design lab

Term Work: 25 Marks Practical Examination:3 Hours, 25 marks
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List of Experiments

All the following Practicals are mandatory.

1. Verify four voltage and current parameters for TTL and CMOS (IC 74LSXX, 74HCXX), (Refer Data-Sheet).
2 .Study of IC-74LS153 as a Multiplexer. (Refer Data-Sheet).
    - Design and Implement 8:1 MUX using IC-74LS153 & Verify its Truth Table.
    - Design & Implement the given 4 variable function using IC74LS153. Verify its Truth-Table.
3. Study of IC-74LS138 as a Demultiplexer/ Decoder (Refer Data-Sheet)
    - Design and Implement full adder and subtractor function using IC-74LS138.
    - Design & Implement 3-bit code converter using IC-74LS138.(Gray to Binary/Binary to Gray)
4. Study of IC-74LS83 as a BCD adder,(Refer Data-Sheet).
    - Design and Implement 1 digit BCD adder using IC-74LS83
    - Design and Implement 4-bit Binary subtractor using IC-74LS83.
5. Study of IC-74LS85 as a magnitude comparator,(Refer Data-Sheet)
    - Design and Implement 4-bit Comparator.
    - Design and Implement 8-bit Comparator
6. Study of Counter ICs (74LS90/74LS93). (Refer Data-Sheet)
    - Design and Implement MOD-N and MOD-NN using IC-74LS90 and draw Timing Diagram.
    - Design and Implement MOD-N andMOD-NN using IC-74LS93and draw Timing Diagram.
7. Study of synchronous counter
    - Design & Implement 4-bit Up/down Counter and MOD-N Up/down Counterusing IC-74HC191/IC74HC193. Draw Timing Diagram
8. Study of Shift Register (74HC194/74LS95), (Refer data-Sheet)
Design and Implement Pulse train generator using IC-74HC194/IC74LS95 (Use right shift/left shift).
    - Design and Implement 4-bit Ring Counter/Twisted ring Counterusing shift registers IC 74HC194/IC74LS95.
9. Write, simulate and verify, VHDL Code for four bit logical and arithmetic operations for ALU.
    - Behavioral modeling
    - Dataflow modeling

10. D FF and JK FF (With Synchronous and asynchronous reset input)
    (Use Behavioral modeling)

    - Write, simulate and verify, VHDL Code for Dflip flop usingSynchronous /asynchronous reset input

    - Write, simulate and verify, VHDL Code for JK flip flop using asynchronous set /reset Input

11. Four bit ripple counter.(Use data flow/Structural modeling)
    - Write, simulate and verify, VHDL codefor four bit ripple up counter
    - Write, simulate and verify VHDL code for four bit rippleup/down Counter using mode control.

Electronics workshop

Term Work: 25 Marks **Practical Examination: 3 Hours, 25 marks**

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It should consist of at least eight circuit simulations and at least one hardware implementations. The simulations may be carried out using any of the simulation software such as ORCAD,MULTISIM etc.

I] Introduction to Spice

II]Simulations using spice

a. Describing Diode and Transistor parameters and plotting the characteristics.
b. Input and Output characteristics of JFET/MOSFET.
c. Bipolar Transistor Amplifier and Transient response of A stable Multivibrator
d. Design of Inverting and Non Inverting Amplifier using op-amp
e. Transient response of an integrator and differentiator with linear ac op-amp model.
f. Finding the Theveninsrms voltage and impedance of an AC circuit.
g. Frequency response of an RLC circuit.
h. Design of oscillator

III] Hardware mini project:Students have to select any topic and complete mini project on it.

He has to perform PCB designing, component selection, mounting, soldering and testing of

mini project.

It is expected by the student to implement hardware mini project circuit using circuit simulation tool MULTISIM.

Reference Books:

1. Introduction to Pspice using ORCAD for Circuits and Electronics 3rd edition by M.H.Rashid (Pearson Education)

2. SPICE for circuits and electronics using PSpiceby M.H Rashid (PHI).
3. SPICE/Simulation software manuals.

Engineering Mathematics – IV

Theory Examination 3 Hours , 80 Marks **Test: 20 Marks**

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Unit-I Vector Space **(07 Hrs)**

Vector spaces, subspaces, linear independence of vectors, Dimension & Basis, Effect of change of basis, Row Space Column Space, Null Space, Rank and Nullity.

Unit-II Linear Transformations **(07 Hrs)**

General Linear Transformation, Range and Kernel of Linear Transformation, Matrix of Linear Transformation.
Eigen value Problems: Eigen values, Eigen vectors, and their applications; Diagonalization.

Unit-III Function of a Complex Variable: **(07 Hrs)**

Introduction to Complex Numbers: Polar form of Complex Number. Relations between Circular function and Hyperbolic functions (only concepts no problems). Limits and continuity of complex functions, derivative of Complex functions, Analytic functions, C-R Equations in Cartesian and polar form, Harmonic function Construction of an analytic function only real or imaginary part is given by Milne Thomson Method. Conformal transformations, Translation, magnification, rotation and bilinear transformations.

Unit-IV Complex Integration **(07 Hrs)**

Line Integral, Cauchy's integral theorem, Extension of Cauchy's integral theorem for multiply connected domain and Cauchy's integral formula, Taylor's and Laurent' series (only problems), Singularities and zeros of complex function, calculation of residue and residue theorem and its application to integration around unit circle.

Unit –V Z-Transform **(06 Hrs)**

Definition, Z- Transform of some standard function, Properties of Z- Transform, Inverse Z-Transform, Application to Difference Equation.

Unit –VI Probability Distribution **(06 Hrs)**

Random variables, discrete probability distribution continuous probability distribution.
Probability distribution: Poisson distribution, Fitting of Poisson distribution & its application.Normal Distribution& its application.

Text Books:

1. B.S.Grewal, *Higher Engineering Mathematics*, 43rd Edition, Khanna Publishers.
2. Howard Anton , *Elementary Linear Algebra with Application,* 9^{th} Edition.
3. R. K. Jain and S.R.K.Iyenger, *Advanced engineering Mathematics*, 3^{rd} Edition, Narosa Pub. House, New Delhi.

Reference Book:

1. E. Kreszig, *Advanced Engineering Mathematics*, 6th edition, Wiley Eastern publication.
2. H. K. Dass, *Advanced Engineering Mathematics,* S. Chand & Company Ltd., New Delhi.
3. B.V. Ramana, *Higher Engineering Mathematics*, Tata McGraw Hill, Publication.
4. P.N. Wartikar and J.N. Wartikar, *Applied Mathematics* (Volumes I and II), Pune vidyarthi Griha Prakashan, Pune.

Electronic Devices and circuits - II

Theory Examination 3 Hours , 80 Marks **Test: 20 Marks**

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UNIT–I] Transistor at high frequency: **[5 Hours]**

Hybrid π common emitter transistor model, hybrid π conductance and capacitance, Common emitter short circuit current gain, single stage common emitter transistor amplifier Frequency response, Gain bandwidth product, Effect of coupling capacitor and bypass capacitor on frequency response. Definition and derivation for fα fβ and f_T, Multi stage CE cascade amplifier, band pass of cascaded stage, Methods of coupling, multistage amplifier.

UNIT–II] RC circuits: **[8 Hours]**

R-C circuit operation and equations; Response of RC circuit to sinusoidal input, step voltage, pulse input, square wave input; Analysis and Design Astable, Bistable and Monostable multivibrator. 555 IC Timer as Monostable and Astable multivibrator & its applications.

UNIT–III] POWER AMPLIFIERS: **[7 Hours]**

Types and applications of power Amplifiers, Transistor power dissipation, Heat transfer in semiconductor devices, Thermal Resistance, Derating; Amplifier classes and efficiency: CLASS A, CLASS B, CLASS C and CLASS AB; Principle of Push pull amplifiers, Push pull drivers, Harmonic distortion and feedback, distortion in push pull Amplifiers, Introduction to complementary push pull amplifier using a single power supply and quasi complementary push pull configuration. -----

UNIT–IV] Operational Amplifier and General linear application. **[8 Hours]**

AC and DC analysis of differential amplifiers; AC, DC parameters and their typical values; Common mode gain, CMRR, methods to improve CMRR, Frequency compensation, Operational amplifier Inverting and non-inverting amplifier Summing ,Differential, Integrator and differentiator. Instrumentation amplifier,.

UNIT–V] Application of OP-AMP with Diode : **[4 Hours]**

Schmitt trigger, window detector, peak detector, precision rectifier, log and antilog amplifier.Amplifier.Phase- - Locked Loops using IC 565 –

UNIT–VI] Voltage Regulators: [8 Hours]

Design of series voltage regulators using discrete components, protection circuit and pre regulator, Design of fixed voltage regulator using (IC 78XX & IC 79XX), Design of adjustable voltage regulators (LM 317, 337), precision voltage regulators (IC 723), basic switching regulators, block diagram of switching regulator IC μA -78S40.

Text Books:

01. J. milliman and C.C. Halkias, Integrated Electronics: Tata McGraw Hill.
02. J. Milliman and Taub, Pulse and digital circuits, Tata McGraw Hill.
03. Ramakant A Gayakwad. Op-Amps and linear integrated Circuits. EEE publication forth

Reference Books:

01 Transistor Circuit Design TEXAS INSTRUMENTS, INC McGraw Hill.
02 Robert Coughlin and Frederick Driscoll. Op-Amp and LIC . Publishers EEE

Analog Communication Systems

Theory Examination 3 Hours , 80 Marks **Test: 20 Marks**

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UNIT–I] Introduction to communication system and signals: [07 Hours]

Electromagnetic frequency spectrum, Overview of Communication systems. Dirac Delta function and its properties and applications, spectral Density, Auto correlation function, Transmission of signals through linear systems, Distortion less transmission, Amplitude and delay distortion, Ideal low pass filters, Hilbert transform, Pre-envelope, Band-pass signals, Band-pass systems,Phase and Group Delay.

need for modulation, Modulation types.

UNIT–II] Amplitude Modulation (AM): [08 Hours]

Types of AM, Generation and demodulation of AM, DSB-SC and SSB signal: Time domain description and Frequency domain description, Square law modulator, switching modulator. Square law detector, Envelop detector, balanced modulator, Ring modulator, Coherent detection of DSBSC wave, Costas receiver. SSB modulation, Frequency discrimination method, Phase discrimination method, comparison.

UNIT–III] Angle Modulation: [06 Hours]

Narrowband and wideband FM, PM, Bandwidth of FM using Carson's rule, Varactor diode modulator, FM detectors: Balanced slope detector, Phase discriminator, Ratio detector, PLL, Non linear effects in FM.

UNIT–IV] Transmitters and Receivers [07 Hours]

AM and FM transmitters, AM Receivers: TRF receiver, Super heterodyne receiver, Performance characteristics of super heterodyne receiver: Sensitivity, Selectivity, Fidelity, Image Frequency Rejection, Automatic Gain Control, Double conversion.Integrated circuit receivers.

UNIT–V]Noise: **[06 Hours]**

Sources of Noise, External and Internal noises, White Noise, Thermal Noise, Shot Noise, Avalanche noise, Signal to noise ratio, SNR, Noise figure, Noise Temperature, Friss formula for Noise Figure, Noise Bandwidth.

UNIT–VI]Noise in continuous wave modulation: **[06 Hours]**

Performance and SNR calculations for AM, DSBSC, SSB and FM receivers, Threshold effects in AM and FM, Capture effect,Pre-emphasis and de-emphasis, narrowband noise.

Text Books:

01. Communication systems by Simon Haykin
02. Electronic Commuinications 4th edition Dennis Roddy John Coolen,PHI
03. Electronic communication systems by G. Kennedy

Reference Books:

01. Principles of communication Systems by Taub and Schilling
02. Modern Digital and Analog Communication systems 3rd edition ,B.P Lathi, Oxford university press

Signals and Systems

Theory Examination 3 Hours , 80 Marks **Test: 20 Marks**

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UNIT-I] Signals and Systems **[10 Hours]**

Continuous-Time and Discrete-Time Signals, Transformations of the Independent Variable, Exponential and Sinusoidal Signals, The Unit Impulse and Unit Step Functions, Continuous-Time and Discrete-Time Systems, Basic System Properties
Linear Time-Invariant Systems:- Discrete-Time LTI Systems: The Convolution Sum, Continuous- Time LTI Systems: The Convolution Integral, Properties of Linear Time-Invariant Systems, Causal LTI Systems described by Differential and Difference Equations

UNIT-II] Fourier series Representation of Periodic Signals **[06 Hours]**

Fourier series representation of Continuous-Time Periodic Signals, Convergence of the Fourier series, Properties of Continuous Time Fourier Series, Fourier series representation of Discrete-Time Periodic Signals, Properties of Discrete-Time Fourier Series, Fourier series and LTI Systems

UNIT-III] Continuous-Time Fourier Transform **[06 Hours]**

Representation of Aperiodic Signals: The Continuous-Time Fourier Transform, The Fourier Transform for Periodic Signals, Properties of the Continuous-Time Fourier Transform, Systems Characterized by Linear Constant-Coefficient Differential Equations

UNIT-IV] Discrete-Time Fourier Transform **[06 Hours]**

Representation of Aperiodic Signals : The Discrete Time Fourier Transform, The Fourier Transform for Periodic Signals, Properties of the Discrete-Time Fourier Transform, Duality, Systems Characterized by Linear Constant-Coefficient Difference Equations

UNIT-V] Sampling **[06 Hours]**

Representation of a Continuous-Time Signal by Its Samples: The Sampling Theorem, Reconstruction of a Signal from Its Samples Using Interpolation, The Effect of Undersampling: Aliasing, Discrete-Time Processing of Continuous-Time Signals, Sampling of Discrete-Time Signals

UNIT-VI] Laplace Transform **[06 Hours]**

Laplace Transform, Region of Convergence for Laplace Transforms, Inverse Laplace Transform, Properties of the Laplace Transform, Analysis and Characterization of LTI Systems Using the Laplace Transform, System Function, Unilateral Laplace Transform

Text Book:

1. Signals and Systems by A. V. Oppenheim, A. S. Willsky, and Nawab.

Reference Books:

1. Signals and Systems by Simon Haykin & Barry Van Veen
2. Fundamentals of Signals & Systems by Michael Roberts

Microprocessor and Interfacing

Theory Examination 3 Hours , 80 Marks **Test: 20 Marks**

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UNIT –I Introduction to Intel 8085 Microprocessor: Basic functions of the microprocessor, System bus, Architecture, Pin Configuration and Programmer's model of Intel 8085 Microprocessor. 06

UNIT –II Intel 8086 Architecture: Major features of 8086 processor, 8086/88 CPU Architecture and the pipelined operation, Programmer's Model and Memory Segmentation 06

UNIT –III Instruction Set of 8086 and Programming: Instruction Set of 8086 microprocessor, Addressing modes of 8086/88, Programming the 8086 in assembly language, Interrupt types in 8086, Dedicated interrupts, Software Interrupts 08

UNIT –IV Designing the 8086 CPU module: 8086 pin description in details, Generating the 8086 System Clock and Reset Signals, 8086 Minimum and Maximum Mode CPU Modules, Memory interfacing with timing consideration, Minimum and Maximum Mode Timing Diagrams 08

UNIT-V Peripheral Controllers for 8086 family and System Design: Functional Block Diagram and description, Control Word Formats, Operating Modes and Applications of the Peripheral Controller namely 8255-PPI, , 8259- PIC and 8237-DMAC.Interfacing Matrix keyboard and Multiplexed display, ADC 0809 and DAC 08 to 8255 PPI 08

UNIT –VI Coprocessor and Advanced Microprocessors: 8087 Architecture , Data types , Instructions and programming, Introduction to 80386,486 ,Protected and Real mode Operation. 04

Reference Books:

1. Ramesh S.Gaonkar, "Microprocessor - Architecture, Programming and Applications with the 8085", Penram International publishing private limited, fifth edition
2. The 8088 and 8086 Microprocessors, walter A Triebel, Awtar Singh, Pearson Education, Fourth Edition
3. Yu-cheng Liu, Glenn A.Gibson, "Microcomputer systems: The 8086 / 8088 Family architecture, Programming and Design", PHI 2003
4. The Intel Microprocessors: 8086/8088, 80186, 80286, 80386 & 80486, Bary B. Brey, Prentice Hall, India 1996.
5. An Introduction to the Intel Family of Microprocessors , James L. Antoakos Third Edition, Pearson Education

Object Oriented Programming

Theory Examination: 2 Hours, 40 Marks **Test: 10 marks**

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UNIT 1 : INTRODUCTION TO C++. **[4 hours]**

Data types, Control Statements – if, if-else, Looping Statements – while, do-while, for, Array, Pointer [Introductory Level]
Function – call by value, address & reference, Structure, POP & OOP differences.

UNIT 2 : Class & Objects. **[6 hours]**

Class specification, class objects, members assessing, constructor, types of constructor, destructor, inline & friend function.

UNIT 3 : Polymorphism & Inheritance. **[7 hours]**

Function overloading, Operator overloading, inheritance & its forms, visibility modes, Concept of virtual class and Virtual function.

UNIT 4 : Other topics. **[3 hours]**

Exception handling mechanism, multiple catch, catching all exceptions, rethrowing. Template class and function.

Reference books :

1. Object Oriented Programming with C++ - E. Balagurusamy

2. Mastering C++ - K. R. Venugopal

Electronic Devices and Circuits Laboratory– II

Term Work: 25 Marks **Practical Examination: 3 Hours, 25 marks**

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LIST OF EXPERIMENTS:

01. Frequency response of CE amplifier

02. Design of RC High pass and Low pass Circuit.

03. Design of transistorized collector coupled AMV

04. Design of transistorized collector coupled MMV

05. Design transistorized collector coupled BMV

06. Schmitt trigger .

07. Precision half wave rectifier.

08. Design AMV and MMV using IC 555

09. Design of transistorized series voltage Regulator

10. Design of voltage regulator using IC 723

11. Design of PLL using IC 565

Note: Minimum eight experiments from above list. Experiment No. 2,3, 6, and7 implemented using multisim or electronic workbench simulation software.

Analog Communication Lab

Term Work: 25 Marks **Practical Examination: 3 Hours, 25 marks**

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List of Experiments :

1: Study of class-C tuned amplifier

2: Generation of AM signal, Calculation of modulation index by graphical method, Power of AM Wave for different modulating signal.

3: Detection of AM signal using envelope detector. Observe the effect of change in RC time constant.

4: Generation of FM signal using varactor diode and NE 566 VCO, calculation of modulation index

5:FM demodulator using IC 565 (PLL based)

6: Detection of FM signal

7: Measurement of selectivity, sensitivity and tracking error in super-heterodyne receiver

8: Generation of AM, DSB-SC and SSB signal using MATLAB

9: Study of pre-emphasis and de-emphasis circuits

10: Build & test AM / FM Transmitter.

Programming Skills Laboratory

Term Work: 25 Marks **Practical Examination: 3 Hours, 25 marks**

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Minimum 8 Experiments should be conducted based on above subject using C++ as under

Unit 1. 1-2 Experiments **Unit 2 :** 2-3 Experiments

Unit 3 : 2-3 Experiments **Unit 4 :** 2-3 Experiments

Microprocessor and Interfacing Lab

Term Work: 25 Marks **Practical Examination: 3 Hours, 25 marks**

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List of Experiments:

1. Write a program to arrange block of data in i) Ascending and (ii) Descending order.
2. Write a program to find out any power of a number
3. Write a programmable delay
4. Write a program to find out largest number in an array.
5. Experiment on String instructions (e.g Reversing of string)
6. Write a program to multiply 32 bit numbers
7. Write a program for code conversion
8. Programming the 8255 to read or write to port (any one application)
9. Interfacing 4x4 keyboard to 8255
10. Programming the 8259 to demonstrate rotating priority, Specific priority ,etc