COURSES OF STUDY (Syllabus)
S. Y. B. TECH. (INSTRUMENTATION)
For the batch registering in 2010-11

Department of Instrumentation Engineering,
SGGS Institute of Engineering and Technology, Vishnupuri, Nanded-431606 (MS), India

(An autonomous institute established by Govt. of Maharashtra)

SGGS Institute of Engineering and Technology, Vishnupuri, Nanded-431606 Department of Instrumentation Engineering,

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STRUCTURE

Course Code	Name of the Course	Total No of credits	Lectures/week	Tutorials/week	Practicals /week
I Semester					
MA201	Engineering Mathematics-III	4	3	1	-
IN201	Sensors and Transducers	4	3	-	2
IN202	Electronic Devices and Circuits	4	3	-	2
IN203	Linear Integrated Circuits	4	3	-	2
IN204	Signals and Systems	3	3	1	-
IN205	Numerical Methods	3	2	-	2
	SubTotal	**22**	**17**	**02**	**08**
II Semester					
MA202	Engineering Mathematics-IV	4	3	1	-
IN206	Digital System Design	5	3	1	2
IN207	Circuit Theory	4	3	-	2
IN208	Electrical and Electronic Measurements	4	3	-	2
IN209	Electrical Machines	4	3	-	2
HU201	Communication Skills	1	-	-	2
	SubTotal	**22**	**15**	**02**	**10**
	Total	**44**	**32**	**04**	**18**

Examination System:

Examination system: Theory courses shall be evaluated twice during a semester (Refer Academic Calendar for details) in the proportion of 30:70 (Mid Term examination: End Term examination). Those courses which have practical component partial or full (Termwork / Sessional) will be evaluated regularly in proportion of 50:50 (Regular assessment: End term evaluation). The practical grades shall appear separately on the grade card.

Attendance Criteria:

Students have to maintain 75% attendance in all the registered courses in a semester to be eligible for appearing examinations.

SEMESTER-I

MA201 Engineering Mathematics-III (4 credits L-3, T-1, P-0)
For all courses of S.Y.B.Tech. Semester-I

1. Differential Second order equation (12 Hours)
   Homogenous linear differential equations for real and complex roots. Modeling: free oscillations, Euler-Cauchy equation, Existence and Uniqueness theorem (without proof) and Wronskian, non-homogenous equations, solutions by undetermined coefficients and variation of parameter methods. Modeling: forced oscillations, resonance and electrical circuits, system of differential equations.
2. Laplace Transform (LT) (12 Hours)
   Definition, existence theorem, linearity property of Laplace transform, LT of standard functions, theorems on LT, Inverse Laplace transforms (ILT), convolution theorem, unit step function, impulse function, LT of periodic functions, applications to initial and boundary value problems.
3. Fourier Series (08 Hours)
   Periodic functions, Fourier theorem, Fourier series, Euler's formulas for the Fourier coefficients, convergence of Fourier series, Change of interval, even and odd functions, half range Fourier series.
4. Partial Differential equations (08 Hours)
   Separation of variables, Vibrations of string, one-dimensional heat equation.

Text/Reference books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Eighth Edition, John Wiley & Sons.
2. R. K. Jain and S. R. K. Iyengar, Advanced Engineering Mathematics, Second Edition, Narosa Publication House.
3. Boycs and DiPrima, Elementary Differential Equations and Boundary Value Problem, Seventh Edition, John Wiley & Sons.
4. Thomos and Finney, Calculus, Ninth edition.

IN201 Sensors and Transducers (4 Credits, L-3, T-0, P-2)

1. The General measurement system: (05 Hours)
   Measurement system-purpose, structure and elements. Generalized performance characteristics: static characteristics of measurement system elements, dynamic characteristics of measurement systems.

2. Variable resistance transducers:

   (05 Hours)

   Potentiometer, strain Gauge, types of strain gauge, Derivation of gauge factor, Bridge configurations, compensation, Applications of strain gauges.
3. Variable capacitive transducers:

   (05 Hours)

   Capacitance principles, capacitive displacement transducers, capacitive level transducers, capacitive hygrometer, and capacitive proximity transducers.
4. Variable inductive transducers:

   (04 Hours)

   Linear variable differential transformer, Rotary variable differential transformer.
5. Temperature transducers: (06 Hours)

   Resistance temperature detector, Thermistor, Thermocouple, Pyrometers, IC temperature transducers.
6. Pressure Transducers: (05 Hours)

   Manometers, Electrical pressure transducers, Vacuum pressure measurements.
7. Flow measurement systems:

   (06 Hours)

   Essential Principles of fluid mechanics, measurement of velocity at a point in a fluid: pitot-static tube, measurement of volume flow rate: differential pressure, mechanical and vortex flow meters, Measurement of mass flow rate: inferential and direct methods, measurement of flow rate in difficult situations: electromagnetic and cross –correlation flow meters.
8. Level measurement: (04 Hours)

   Level formulae; level sensing devices, direct level sensing, indirect level sensing, and application considerations.

Term Work:

Term work shall consist of any 10 experiments from the list given below.

1. To determine the LVDT characteristics.
2. To determine the characteristics of capacitive displacement transducer.
3. To determine strain gauge characteristics.
4. To determine thermocouple characteristics.
5. To determine RTD characteristics.

6. To determine thermister characteristics.
7. To determine Rotameter characteristics.
8. To determine level transducer characteristics.
9. To determine flow using orifice or venturimeter or rotameter and compare the accuracy.
10. To determine distance using ultrasound transducer.

Practical Examination:

It shall consist of practical and oral based on syllabus.

Reference books:

1. Bentley J.P., Principles of measurement systems, Third Edition, Pearson education Asia pvt.ltd, 2000.
2. Doebelin, E.O., Measurement Systems, McGraw Hill Book Co., 1998
3. Patranabis D, Sensors and Transducers, Wheeler Publishing Co., Ltd. New Delhi, 1997.
4. Murthy, D.V.S., Transducers and Instrumentation, Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
5. Neubert, H.K.P., Instrument Transducers, Clarenden Press, Oxford, 1988.

IN202 Electronic Devices and Circuits (4 credits L-3, T-0, P-2)

1. Transistors: (03 Hours)
Introduction to BJT and FET characteristics and configurations, DC analysis of BJT and FET, power considerations. BJT and FET as amplifier, Amplifier step response and frequency response.

2. Transistor at Low Frequencies: (08 Hours)
Graphical analysis of CE configurations, Two port devices and the hybrid model, Transistor hybrid model, The h-parameters, Conversion formulas for the parameters of the three transistor configurations, small signal analysis of transistor amplifier circuits using h-parameters, Comparison of transistor amplifier configurations, Linear analysis of transistor circuits, Miller theorem and its dual, Simplified common-emitter and common-collector hybrid model, Common-emitter amplifier with an emitter resistance, Emitter follower, Darlington emitter follower with boostrapping Design of single stage CE amplifiers.

3. Transistor at High Frequencies: (05 Hours)
Hybrid-pi (π) common emitter transistor model, Hybrid π conductance and capacitances, Variation of hybrid π parameters, CE short-circuit current gain, Gain bandwidth product, Emitter follower at high frequencies, single stage CE amplifiers frequency response.

4. Multi stage amplifier: (05 Hours)
   Classification, distortion, noise, frequency response, Band pass of cascaded stages, RC coupled amplifier, Low frequency response of RC coupled amplifier, Effect of an emitter bypass capacitor on low-frequency response, High frequency response of two cascaded CE transistor stages, Multi stage CE amplifier cascade at high frequency.
5. Large signal (Power) Amplifiers and output stages: Power amplifiers, power transistors, classes of amplifiers, class-A B, AB and C, class AB push-pull and complementary symmetry amplifier. (04 Hours)
6. Feedback Amplifiers: (05 Hours)
   Classification, Feedback concept, Transfer gain with feedback, General characteristics of negative feedback amplifier, Input and output resistance, Method of analysis of feedback amplifier, Voltage-series, Current-series, Voltage–shunt, Current-shunt feedback. Positive feedback in amplifiers, Barkhausen's criterion and stability of oscillators, sinusoidal oscillators – RC, LC and crystal oscillators.
7. MOS Field Effect Transistor: (05 hours)
   Operating modes, Ideal and non ideal current-voltage characteristics, DC circuit analysis, basic applications such as: switch, digital logic gate, amplifier. Amplifier configurations such as: common source, common gate, source follower. DC analysis and small signal analysis.
8. Multivibrators: (05 Hours)
   Astable, bistable, and monostable multivibrators, Commutating capacitors, Triggering methods, Schmitt trigger, Gate width, Temperature effect on gate width, Astable time periods, Recovery at collector, Gated astable multivibrator, Sweep Generators.

Termwork:

It should consist of a record of at least four SPICE circuit simulations and at least six experiments using discrete electronic components / devices from the following list for circuits' implementation and one mini project.
The simulations may be carried out using any version of SPICE. SPICE circuit simulations may consist of different types of analysis, modeling and simulation of diode, BJT, FET, op-amp and digital circuits, different types of analysis of active and passive circuits, limitations of SPICE.

List of experiments:

1. To study BJT hybrid parameters.
2. To study performance and frequency response of single stage amplifiers using BJT and FET.
3. To study performance of emitter follower/Darlington emitter follower.

4. To study frequency response of two-stage RC coupled amplifier.
5. To study of class AB push-pull power amplifier.
6. To study of RC phase shift oscillator and Hartley/ Colpitts oscillator.
7. To study IV characteristics of JFET and MOSFET.
8. Design and implementation of Astable and Monostable multivibrators.
9. Study of Schmitt trigger.

Mini-project:

Design and implementation of Regulated DC power supply / Signal generator.

Practical Examination:

It shall consist of practical and oral based on syllabus.

Text/Reference Books:

1. J. Millman and C. C. Halkias, Integrated Electronics: Analog and Digital Circuits and Systems, Tata McGraw-Hill Publishing Company, 1988.
2. Donald A. Neamen, Electronic Circuit Analysis and Design, Tata McGraw-Hill.
3. Robert L. Boylestad, Louis Nashelsky, Electronic Devices and Circuit Theory, Eighth edition, PHI publishers, 2004.
4. J. Millman and Taub, Pulse and Digital Circuits, Tata McGraw Hill.
5. N. C. Goyal and R. K. Khetan, A Monograph on Electronic Design Principles, Khanna Publishers.
6. Horowitz and Hill, The Art of Electronics, 2nd edition, Cambridge 1989.
7. Rashid, Spice for Circuits and Electronics Using PSPICE, 2nd edition, 1995.

IN203 Linear Integrated Circuits (4 credits L-3, T-0, P-2)

1. Integrated circuits: (04 Hours)
   An over view of IC design technology, Introduction to wafer cleaning, photolithography, Ion implantation. Classification of IC families and their comparison. Study of data sheets of 741, 301, OP-07 and 324. Op-amp ideal characteristics and op-amp parameters.
2. OP-amp with positive and negative feedback: (08 Hours)
   Inverting, Non inverting and differential amplifier configuration and their special cases. Summing, scaling, averaging, instrumentation amplifier, integrator and differentiator, V to I and I to V converters.

3. Active filters and oscillators: (06 Hours)
   Frequency response of op-amp. Low pass, high pass first and second order, band pass, band reject and all pass Butterworth filters.
4. Introduction to Oscillator using op-amps: (06 Hours)
   Phase shift oscillator, Wein bridge oscillator, square wave, triangular wave and saw tooth wave generators.
5. Comparators and converters: (06 Hours)
   Basic comparators, zero crossing detector, Schmitt trigger, voltage limiters, V/F and F/V converter, Clippers and Clampers, absolute value o/p circuit, sample and hold circuit, D/A converters- resisting divider and ladder networks. A/D converters, counters- Ramp type, dual slope, integration techniques, successive approximation, parallel comparison techniques.
6. Study of some important IC's: (08 Hours)
   The 555 timer and its applications, The 723 and 78xx and 79xx voltage regulator IC's, The PLL IC's 565 and its applications, DAC 0808, ADC 0809.
7. Analog computation and simulation: (02 Hours)
   Introduction to analysis of linear differential equations, time and magnitude scaling, Applications to transfer function simulations.

Term Work:

It shall consist of a record of at least 08 experiments from the following list.

1. Measurement of op-amp parameters and comparison with op-amp data sheets.
2. Assembling of op-amp inverting, noninverting and differential circuit to measure an input in the range of mill volts to few volts.
3. Design and signal conditioning circuits using RTD and thermister with an instrumentation amplifier to read a temperature of water bath and calibration.
4. Design of signal conditioning circuit to operate a relay or to generate timing delays (e.g.10 sec., or 20 or 20 sec. or 1 minute) using IC 555.
5. Design of a circuit to work as a current source using IC 78xx.
6. Design of a circuit to work as voltage regulator of 10 or 20 volts using IC 723.
7. Precision rectifier to rectify few volts as input.
8. Use of 565 PLL as a frequency multiplier.
9. Design of Oscillators using op-amp. and testing.
10. Design of single stage differential amplifier and testing.

11. Design of low and high pass filters with a cut off frequency of 1 KHz or 2 KHz and testing for frequency response.
12. Design of instrumentation amplifier using 3 op-amps and testing for gain, frequency response.
13. Design of cascade amplifier system using op-amp and testing for gain and frequency response.
14. Study of A/D and D/A convertors.
15. Design of attenuator circuit using amplifier and testing for gain.
16. Testing of faulty analog instrument and finding faults.
17. Design of band pass filter using op-amp and testing for frequency response.

Practical Examination:

It shall consist of practical and oral based on syllabus.

Reference Books:

1. Ramakant A. Gaikwad, Op-amp and Integrated circuits, Fourth edition, PHI Publication, 2002.
2. Sergio Franco, Design with Op-amp and Analog Integrated circuits, Tata McGraw Hill Edition, New Delhi.
3. V. Rajaram, Analog Computation and Simulations, Prentice Hall of India, New Delhi.
4. Robert F. Coughlin and Frederick F. Driscoll, Operational Amplifiers and Linear Integrated Circuits.
5. L. K. Maheshwari and M.M. S Anand, Analog Electronics, Prentice Hall of India, New Delhi.
6. S. M. Sze, Physics of Semiconductor Devices, John Wiley Publications.

IN204 Signals and Systems (3 Credits, L-3, T-1, P-0)

1. Continuous–Time and Discrete –Time Signals: (04 Hours)

   Various classifications; Mathematical Representation; Signal Energy and Power. Transformations of the Independent Variable; Periodic Signals; Even and Odd Signals; Arithmetic Operations on Sequences; Continuous-Time and Discrete-Time Complex Exponential. The continuous-Time Unit Step and Unit Impulse Functions. The Discrete-Time Unit Impulse and Unit Step Sequences; Representation of Direct-Time Signals in Terms of impulse.

2. Continuous-Time and Discrete-Time Systems: (04 Hours)

   Interconnections of Systems; Basic System Properties (Causality, Stability, Time-Invariance, Linearity, Invertibility, systems with and without, memory).

3. Linear Time –invariant systems: (05 Hours)

   The Discrete–Time and Continuous-Time LTI Systems; Unit Impulse Response; Convolution Sum and Convolution Integral Representation. Properties of LTI Systems (Commutative, Distributive, Associative Properties, Invertibility, Causality, Stability). The Unit Step Response of an LTI System; LTI Systems Described by Differential and the Difference Equations; Block Diagram Representations; Singularity Functions.

4. Fourier Series Representation of Periodic Signals: (05 Hours)

   The Response of LTI Systems to Complex Exponential; Fourier Series Representation of Continuous-Time and Discrete–Time periodic Signals; Convergence of the Fourier Series; Properties of Discrete-Time and Continuous-Time Fourier Series; Fourier Series and LTI Systems.

5. The Continuous-Time Fourier Transform: (05 Hours)

   Representation of Continuous-Time Aperiodic Signals and Continuous-Time Fourier Transform; the Fourier Transform for Periodic Signals; Properties of Continuous-Time Fourier Transform; Fourier Transform and LTI Systems.

6. The Discrete- Time Fourier Transform: (05 Hours)

   Representation of Discrete-Time Aperiodic signals and the Discrete-Time Fourier Transform; Fourier Transform for Periodic Signals; Properties of the Discrete-Time Fourier Transform; Discrete-Time LTI Systems and Discrete-Time Fourier Transform.

7. Sampling: (04 Hours)

   Representation of a continuous–Time Signal by its Samples; The Sampling Theorem; Reconstruction of Signals form its Samples using Interpolation; Effect of Under Sampling (Frequency Domain Aliasing); Discrete Time processing of Continuous–Time Signals.

8. The Laplace Transform: (04 Hours)

   The Laplace Transform; Region of Convergence for Laplace Transform; Properties of Laplace Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Laplace Transform; Analysis and Characterization of LTI Systems using the Laplace Transform; System Transfer Function; Block Diagram

Representations; The Unilateral Laplace Transform; Solution of Differential Equations using the Unilateral Laplace Transform.

9. The Z Transform: (04 Hours)

   The Z Transform; The Region of Convergence for the Z- Transform; Geometric Evaluation of the Fourier Transform from the Pole-Zero Plot; Properties of Z-Transform; Analysis and Characterization of Discrete-Time LTI Systems using Z-Transform; System Transfer Function; Block Diagram Representation; The Unilateral Z-Transform; Solution of Difference Equation using the Unilateral Z-Transform.

Reference Books:

1. A. V. Oppenheim, A. S. Willsky with S. H. Nawab, Signals and Systems, Prentice- Hall of India Private Limited, Second Edition, 1997.
2. S. Haykin and B. V. Veen, Signals and Systems, John Wiley and Sons, Inc., Second Edition, 1999.
3. M. J. Roberts, Signals and Systems: Analysis using , Transform Methods and
   MATLAB, Tata McGraw-Hill Publishing Company Limited, Second Edition, 2003.

IN205 Numerical Methods (3 Credits, L-2, T-0, P-2)

1. Computer Arithmetic: (02 Hours)
   Floating Point representation, Arithmetic operations with normalized floating point numbers, errors in numbers, Truncation error, round off error, inherent error, absolute and relative error.

2. Solution of Non linear equations: (04 Hours)

   Bisection method, false position method, Newton-Raphson method, Method of successive approximation, rate of convergence.

3. Interpolation: (06 Hours)

   Lagrange's interpolation, difference table, Newton's Interpolation, iterated linear interpolation technique.

4. Solution of simultaneous algebraic equations: (06 hours)
   Gauss elimination method, Iterative methods and their convergence. Ill-condition equation.

5. Numerical Integration: (04 Hours)
   Trapezoidal rule, Simpson's 1/3 and 3/8 rule, Romberg integration, Newton's cote's integration formula, error in these formulae.
6. Solution of Ordinary differential equation: (06 Hours)
   Taylor series method, Picard's method, Euler method, Runge-Kutta method second and fourth order, predictor corrector method.
7. Numerical solution of partial differential equation: (06 Hours)
   Finite difference, approximation to derivatives. Laplace equation, Iterative methods for the solution of equations.
8. Least square approximation of functions: (04 Hours)
   Linear regression, Polynomial regression, fitting exponential and trigonometric functions.

NOTE: The following aspects are to be considered while dealing with topic from Numerical Methods.
1. Study of Particular method.
2. Use of method for solving a problem
3. Developing algorithm, flow-chart and computer program in any language.

Term work:

Term Work shall consists of a record of at least 10 computer programs based on numerical methods given in the syllabus along with the program printout, algorithm and flow chart.

Practical Examination:

Practical examination shall be of 3 hours duration. The students have to write an algorithm, flow chart for the problem given by an examiner. He should develop software and execute it on the computer system and get its printout and face the oral based on above syllabus.

Reference Books:

1. V. Rajaraman - Computer Oriented Numerical Method- Prentice Hall of India.
2. S.S. Shastry- Introductory methods of numerical analysis., Prentice Hall of India
3. Thomas Richard Mecalla- Introduction to numerical Methods and FORTRAN programming- Willey International Edition.
4. Steven C. Chapra and Raymond P. Canale, Numerical methods for Engineers, Mc-Graw-Hill Publication, 2007.
5. B.S. Grewal- Numerical Methods in Engineering & Science, Khanna Publishers.

SEMESTER-II

MA202 Engineering Mathematics – IV (4 Credits L-3, T-1, P-0)

Course for S.Y.B.Tech. (Instrumentation Engineering)

1. Vector Calculus: (20 Hours)

   Vector function, limit and continuity of vector function, derivative vector function, differential geometry (tangent normal and curvature), point function, directional derivatives, Line, Surface and Volume integrals, Stokes, Gauss and Green's theorems.

2. Complex variables: (06 Hours)

   Algebra of Complex Numbers: Polar form of Complex Number, De Moivre's Theorem and its applications to roots of the equations.

3. Complex Functions: (24 Hours)

   Circular function and Hyperbolic functions, Logarithmic of Complex Number, Limits and continuity of complex functions, derivative of Complex functions, Analytic functions, conformal mappings, bilinear transformations, Complex integration, Cauchy's integral theorem and integral formula, Taylor's and Laurent' series, Residue theorem, solution integrals.

Reference Books:

1. Erwin Kreyszig, Advanced Engineering Mathematics, Wiley India publication, Eighth Edition,
2. Monty J. Strauss, Gerald L. Bradley, Karl J. Smith, Calculus, Pearson Education, Third Edition,
3. R. K. Jain and SRK. Iyengar, Advanced Engineering Mathematics, Narosa Publication, Third Edition,
4. Michael D. Greenberg, Advanced Engineering Mathematics, Second Edition, Pearson Education

IN206 Digital System Design (5 Credits, L-3, T-1, P-2)

1. Introduction: (12 Hours)
   Introduction to digital design, analog Vs. digital, digital devices, electronic aspects of digital design, software aspects of digital design, programmable logic devices, ASICs, PCBs, digital design levels, revision of number systems and codes, binary arithmetic revisited.
   Logic families: DTL, RTL, ECL, I^2L, TTL, MOS/ CMOS, comparison of TTL and CMOS characteristics, interfacing techniques.
   Semiconductor Memories, Memory organization and operation, expanding memory size, classification and characteristics of memories, sequential memories, Read only memories, R/W memories, content addressable memories, PLA and CCD memories.

2. Combinational Logic Design: (12 Hours)
   Switching algebra, combinational circuit analysis, combinational circuit synthesis, and combinational circuit minimization, K-Map of three, four, five variable functions, minimizing SOP and POS expressions. Quine McClusky minimization, other minimization methods, timing hazards, designing hazard free circuits, circuit timing, combinational PLDs, PLAs, PLA devices, generic array logic devices, design of encoders, decoders, tri-state devices, multiplexers, demultiplexers, comparators, arithmetic circuits– half and full adders, ripple adders, subtractors, carry look ahead adders, combinational multipliers, examples- barrel shifter, floating point encoder etc.

3. Sequential logic design: (12 Hours)
   Latches and flip flops, edge triggered and master slave flip flops (SR, JK, D, T etc), clocked synchronous state machine analysis and design, designing state machines using state diagrams, state machine synthesis using transition lists, decomposing state machines, feedback sequential circuit design, sequential PLDs, Counters and shift registers, synchronous design methodology, clock skew, gating the clock, asynchronous inputs.

4. Designing using VHDL: (06 Hours)
   Introduction to VHDL, modeling styles, data flow, behavioral, structural and mixed, VHDL description of combinational networks, modeling flip flops using VHDL, VHDL models for multiplexers, compilation and simulation of VHDL code, modeling a sequential machine, variables, signals and constants, arrays, VHDL operators, VHDL functions,

VHDL procedures, attributes, multilevel logic and signal resolution, test benches.

Termwork:

Experiments (Hardware based)

At least 4-6 experiments have to be performed from the following:

1. Implementation of basic Logic gates using universal gates.
2. Design and performance of Half and Full adders and subtractors.
3. Design and performance of Code converters.
4. Design and performance of Multiplexer / demultiplexer.
5. Design and implementation of Flip-flops.
6. Design of synchronous and asynchronous counters.
7. Design and implementation of ALU.
8. Performance of RAM and EPROM.
9. Transfer characteristics of TTL and CMOS family.

Experiments (Software based)

Modeling, simulation, synthesis and implementation of

1. Simple digital circuits in VHDL.
2. Combinational design of arithmetic circuits in VHDL.
3. Flip flops, comparators, Encoders, decoders.
4. Sequential machines.

Practical Examination

It shall consist of practical and oral based on syllabus.

Text /Reference books:

1. Stephan Brown, Zvonko Vranesic, Fundamentals of Digital Logic with VHDL Design, McGraw Hill, Second Edition, 2005.
2. Frank Vahid, Digital Design, Preview Edition, John Wiley & Sons Inc., 2005.
3. J. F. Wakerly, Digital design- Principles and Practices, PH International /Pearson India, Third Edition.
4. Samuel C. Lee, Digital Circuits and Logic Design, Prentice Hall of India, New Delhi, 1976.
5. Charles. H. Roth, Jr., Digital System Design using VHDL, PWS Publishing Company, 1998.
6. Morris Mano: Digital Design, 2nd edition, Prentice Hall of India Publication, New Delhi.

IN207 Circuit Theory (4 Credits, L-3, T-0, P-2)

1. Development of Circuit Concepts: (02 Hours)

   Charge, Current, Voltage, Energy, introduction to basic passive circuit parameters.

2. Conventions for Describing Networks: (04 Hours)

   Reference direction for current and voltage, active element convention, source transformation, dot convention for coupled circuits, Topological description of networks.

3. Network Equations: (04 Hours)

   Kirchoff's laws, number of network equations, loop variable analysis, node variable analysis, duality, formation of network equation in matrix form, network solution by Laplace Transformation technique.

4. Initial Conditions in Networks: (04 Hours)

   Use and study of initial conditions in various elements, a procedure for evaluating initial conditions.

5. Transform of Other Signal Waveform: (06 Hours)

   The shifted unit step function, ramp and impulse function, waveform synthesis, initial and final valve theorem, convolution integral, convolution as a summation.

6. Impedance Functions and Network Theorems: (08 Hours)

   The concept of complex frequency, transform impedance and transform circuits, series and parallel combination of elements, Thevenin's, Superposition, Millman's, Tellegen's, Reciprocity, Norton and Maximum power transfer theorems.

7. Network Functions: (06 Hours)

   Network functions for one port and two-port network, calculation of network functions, Ladder networks, General networks. Poles and zeros of network functions, restriction on poles and zeros locations for driving point functions and transfer functions, Time domain behavior from pole and zero plot.

8. Two-Port Parameters: (04 Hours)

   Relationship of two port variables, short circuit admittance parameters, open circuit impedance parameters, transmission parameters, hybrid

parameters, relationship between parameters sets, parallel connection of two port networks.

9. Sinusoidal Steady-State Analysis: (02 Hours)

   The sinusoidal steady-state, the sinusoid and solution using $e^{\pm j\omega t}$, phasors and phasor diagrams.

Term Work:

Term work shall consist of minimum 6 experiments from the list given below

1. Verification of Maximum power transfer theorem.
2. Verification of Thevenin's theorem.
3. Verification of Superposition theorem.
4. Plotting of behavior of RC circuit for step input.
5. Plotting of behavior of RL circuit for step input.
6. Plotting of behavior of RLC circuit for step input.
7. Determination of hybrid and impedance parameters of a given network.
8. Sinusoidal study of RC and RL series networks.

Practical Examination:

Practical examination shall consist of performance of the experiment carried out at the time of examination and viva- voce based on the term work submitted by the student for the subject.

Reference Books:

1. M. E. Van Valkenberg, Networtk analysis, Third Edition, Prentice Hall of India Publication, 1996.
2. C. P. Kuriakose, Circuit Theory: Continuous and Discrete Time Systems, Elements of Network Synthesis, Prentice Hall of India Publication, New Delhi, 2005.
3. L. P. Huelsman, Basic Circuit Theory, Third Edition, Prentice Hall of India, New Delhi, 2002.
4. W. H. Hayt. Jr. and J. E. Kemmerly, Engineering Circuit Analysis, Fifth Edition, Tata-McGraw Hill Edition, 2000.

IN208 Electrical and Electronic Measurements (4 Credits, L-3, T-0, P-2)

1. Electro mechanical instruments:
   Moving coil, moving iron, dynamometer type, rectifier type, thermal instruments. Application of PMMC meter. Current transformer and Potential transformer. Tong Tester, Phase sequence indicator.
2. Power and Energy Measurements:
   Electrodynamic wattmeters, Hall effect wattmeter, thermal type wattmeter, compensated wattmeter, single and three phase power measurement, calibration of wattmeter. Energy measurement, maximum demand meter, P.F meter, Megger.
3. D.C bridges:
   Low, high and precise resistance measurement. A.C bridges: Inductance and capacitance measurements. Detectors in bridge measurement, Wagner ground connections, transformer ratio bridges. Series and shunt type ohmmeter.
4. Electronic measurements:
   Analog and digital multimeters, digital wattmeter/energy meter. Signal Generators. Frequency measurement, measurement of period, time and phase angle.
5. Waveform analyzing instruments:
   Distortion meter, Spectrum analyzer.
6. Oscilloscopes:
   Analog and Digital.

Text Books:

1. Golding, E.W. and Widdis, F.C., Electrical Measurements and Measuring Instruments, Fifth edition, A.H.Wheeler and Co, 1993.
2. Baldwin, C.T., Fundamentals of electrical measurements – Lyall Book Depot, New Delhi, 1973.
3. David.A.Bell, Electronic Instrumentation and Measurements, Second Edition, Prentice Hall, New Jersy, 1994.

Reference Books:

1. Cooper, W.D. and Helfric, A.D., Electronic Instrumentation and Measurement Techniques, Prentice Hall of India, 1991.
2. Kalsi.H.S., Electronic Instrumentation, Tata McGraw Hill, New Delhi, 1995.

Term work:

It will consist of a record of at least six of the following experiments based on the prescribed syllabus.

1. Measurement of resistance (high, medium, low)

2. Measurement of inductance.
3. Measurement of capacitance.
4. Phase and frequency measurement on CRO using Lissajous pattern.
5. Study of digital voltmeter, digital multimeter.
6. Study of recorders.
7. Digital measurement of phase and frequency.
8. Study of AC and DC meters.
9. Measuring current and voltage.

Practical Examination:
The examination will be of three hours duration and will consist of an experiment based on term-work and followed by an oral based on above syllabus.

IN209 Electrical Machines (4 Credits, L-3, T-0, P-2)

1. Introduction: (02 Hours)
   Fundamentals, physical concepts, operating principles and rigorous development of circuit model equations of different electrical machines.
2. Single phase transformers: (05 Hours)
   Transformer construction and practical consideration, transformer reactance and equivalent circuits, testing, polarity test, open – circuit (O.C.) and short circuit (S.C.) Test, instrument transformers-current transformer and application potential transformer, pulse transformer and application.
3. Three Phase Transformers**:** (05 Hours)
   3-Ǿ transformer, 3-Ǿ transformer connectivity, star/star-Delta/Delta – Star/Delta-Delta/Star Open-Delta or V-V connection–Scott connection. Three phase to Two-phase conversion and vice-versa, parallel operation of 3-Ǿ transformer.
4. D.C.Generator**:** (05 Hours)
   Principle, construction and working of D.C. generator, practical generator, pole cores and pole shoe, Armature core, armature windings, commutator, Lap and wave winding, types of generator, EMF equation of a D.C. Generator, Iron losses in armature, total losses in Generator, condition for maximum efficiency, characteristics of generator.
5. D.C.Motor**:** (05 Hours)
   Principle, comparison of generator and Motor action significance of back emf, voltage equation of a motor, condition for maximum power, torque Armature torque of a motor , shaft torque , speed of d.c.motor, speed regulation, motor characteristics, characteristics of shunt motors,

compound motors, comparison, speed control of D.C.shunt motor , types of starter.

6. Induction Motor: (08 Hours)
   General principle, construction, stator squirrel cage, rotor, Rotor rotation, slip, frequency of rotor current, starting torque for squirrel cage motor, slip-ring motors, condition for maximum starting torque. Relation between torque and slip, effect of changes in supply voltage on torque & speed, full load torque and maximum torque . Equivalent circuits of rotor, and an induction motor, single phase I.M. Revolving Theory, Equivalent circuit of a single-phase motor, Types of single phase motors.
7. Alternator: (05 Hours)
   Basic principles, construction, star and Delta connection, Equation of induced EMF, alternator on load, vector diagram, voltage regulation, parallel operation of two alternators.
8. Synchronous Motor**:** (05 Hours)
   Principle of operation, method of starting, Motor on load, effect of increase in load, different Torque in a synchronous Motor, Torque Developed by the Motor, alternative Expression for power developed.

Text/Reference Books :

1. B.L.Theraja, A.K. Theraja, A Textbook of Electrical Technology, Vol-II, S.Chand & Co.,New Delhi, 2005.
2. Edward Hughes, Electrical and Electronic Technology, Pearson Education, 2002.

Term work:

It will consist of a record of at least eight of the following experiments based on the prescribed syllabus.

1. Characteristics of D.C. Motor.
2. Characteristics of D.C. Generator.
3. Speed control of D.C. motor.
4. Study of D.C.Motor starter.
5. Short circuit and open circuit test of transformer.
6. Power measurement in 3- Ǿ start connected load.
7. 3-Ǿ Power measurement in 3-Ǿ delta connected load.
8. Energy calculation/Electrical Load measurement/calculation/study of Energy meter
9. Study of induction motor
10. Study of Alternator
11. Study of synchronous motor.

Practical Examination:
The examination will be of three hours duration and will consist of an experiment based on term-work and followed by an oral based on above syllabus.

HU201: COMMUNICATION SKILL (Credits 1, L-0, T-0, P-1)

Objective: The main objective of this course is to prepare the engineering students for future career, further studies through development of listening, reading ,writing and speaking skills.
Methodology: The course may be dealt with in following ways: -

1. Discussion by tutor about theoretical nature of different aspects of Communication Skill.
2. Practice of it by the students as pronunciation, public speaking and organizing meeting etc.
3. Intervention by the tutor for corrective measures.
4. Understanding and grasping and then reporting by the students.
5. Contents: What is communication- need, importance, types, and objectives. Communication process & barriers. Principles of effective communication, Personality Development, SWOT Analysis, Stress Management, Building Positive Attitude, etc
6. Modes of communication.
7. Practice of effective communication through eye contact, voice modulation, audience awareness, presentation plan and verbal & non-verbal Communication.
8. Face to face conversation with body language.
9. Understanding guidelines for telephonic conversation, making and receiving calls, telephonic messages.
10. Interviews Skills for employment – Preparing - Group Interview, Lunch / Dinner Interview, Telephonic Interview, self and reporting for sample questions on educational background, co-curricular activities, extra curricular activities, experience, and general knowledge, miscellaneous.
11. Technical Guidelines for Communication - Hyphenated words, Use of Apostrophe, Abbreviations, Units , etc.
12. Meetings: understanding role and importance of procedure, chairmanship, participation, and physical arrangements, rules for successful meeting- experience sharing and reporting.
13. Group Discussions, Seminars and Conferences- Understanding different aspects-experience sharing and reporting.
14. Practice of public speaking with use of audio – Visual and Graphic aids, experience sharing and reporting.
15. Paragraph writing – Understanding principles, general hints writing and analyzing (practising paragraph writing on 3-5 topics)

16. Understanding the principles and practice of – office drafting, circular, notices, memos, and telex/telegraph/email messages. Application resumes, sales enquiry, reply order, complaint Reports, feasibility report, analytical report, progress report, project report, inspect of damage and losses etc.
17. Preparation of notices, agenda, minutes etc.
18. Grammar – Articles, Tenses, The Preposition, Choice of Words and Phrases, Words commonly Misspell, Confusing words and Expressions, etc.
19. Phonetics – Pronunciation, Articulation of sounds structure of syllable stress, rhythm, connected speech, intonation, clarity and pitch.
20. Use of integrated skills of communication.

Term work and Reporting:
Term work will be in the form of Report containing minimum 10-12 exercises based on separate topics as mentioned in the syllabus.
The concerned teacher will make the assessment or an internal examiner appointed by the Principal of the College.

Reference Books:

1. Developing Communication Skill by Krishna Mohan and Meera Banerjee, McMillan Publishers.
2. Communication Skill – B.V. Pathak, Nirali Prakashan.
3. Writing Correct English – Readers Digest Publication.
4. Communication Skills for Engineers - Sunita Mishra, C. Murlikrishna.
5. Professional Communication Skills-- S. Chand.
6. Developing Communication Skills-- Krishna Mohan, Meera Banerji.
7. Communicative Grammar and Composition-- Rajesh K. Lidiya.

Note: Exercises on Chapter No. 1, 2, 3 and 7 are desirable and one each on other topic is essential.