Revised S. Y. B. Tech (Instrumentation Engineering) Curriculum

Academic year 2015-16

SGGS INSTITUTE OF ENGINEERING & TECHNOLOGY, VISHNUPURI, NANDED

S.Y. B. Tech (Instrumentation Engineering) Curriculum Structure: CBCS - I
(Effective from Academic year 2015-16)

Semester-III						
Course Code	Course Title	Lectures (L)	Tutorials (T)	Practical (P)	Credits	
					Th.	Pr.
MA201	Engineering Mathematics-III	4	-	-	4	-
IN201	Sensors and Transducers	3	1	2	4	1
IN202	Electronics Devices and Circuits	3	1	2	4	1
IN207	Circuit Theory	3	-	2	3	1
IN209	Electrical Machines	3	-	2	3	1
HS221	Human Values and Professional Ethics	2	-	-	2	-
Total		**18**	**02**	**08**	**24**	
Semester-IV						
Course Code	Course Title	Lectures (L)	Tutorials (T)	Practical (P)	Credits	
					Th.	Pr.
MA202	Engineering Mathematics-IV (Elective – I)	4	-	-	4	-
IN203	Linear Integrated Circuits	3	-	2	3	1
IN204	Signals and Systems	3	1	-	4	-
IN206	Digital Electronics and Logic Design	3	1	2	4	1
IN208	Electrical and Electronics Measurements	3	-	2	3	1
HS222	Professional Communication	2	-	2	2	1
Total		**18**	**02**	**08**	**24**	

Elective – I

MA202(I)	:	Complex Analysis
MA202(II)	:	Statistics and Probability
MA202(III)	:	Numerical Methods
MA202(IV)	:	Discrete Mathematics

CONTENTS

Semester-III

MA201 Engineering Mathematics-III

Teaching scheme:			Examination scheme:
Lectures	4	hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials		hrs/week	
Credits	4		

Course Objectives:	
1.	To acquaint student with: the basic concepts of an ordinary differential equations, partial differential equations, Mathematical Modelling in physical problems. Initial and boundary value problems. Motivate students to use critical thinking skill to solve practical problems.

Course Outcomes: At the end of the course the student is expected to understand:	
1.	Importance of differential equations i.e. ODE and PDE in physical problems.
2.	Able to solve IVP in electrical and mechanical problems.
3.	Analysing physical phenomena in engineering and technology by using this theory.

Syllabus:	
Unit 1	Basic Concepts & Ideas, Geometric Meaning of y′= f(x, y) , direction field , exact equations, Integrating factors, Linear differential equation, Bernoulli's equations, orthogonal trajectories, applications to electrical circuits.
Unit 2	Second Order Differential equations, Homogeneous linear differential equation for real & complex roots, Euler Cauchy equation, existence & uniqueness theorem (Without proof) & Wronskian.
Unit 3	Non homogeneous equation, solutions by undetermined coefficients & Variation of parameter methods, modelling, forced oscillation, resonance & electrical circuits, system of differential equations.
Unit 4	Fourier Series, Periodic function, Fourier theorem Euler's formulae for the Fourier coefficients, convergence of Fourier series, change of interval, even & odd functions, half range Fourier series.
Unit 5	Partial differential equations, Separation of Variables, Vibrations of string, one dimensional equation.

Text Books:	
1.	Advanced Engineering Mathematics – R.K Jain & S.R.K Iyenger
2.	Advanced Engineering Mathematics- Erwin Kreyszig
3.	Elementary Differential Equation(eighth edition) W.E Boyce & R. Diprima (John Wiley 2005)
4.	Fourier series & boundary Valued Problems., R.V Churchill & JW Brown(Seventh edition) Mc Graw Hill(2006).

IN201 Sensors and Transducers

Teaching scheme:			Examination scheme:
Lectures	3	hrs/week	Theory Mid Term : 30 marks,
Tutorials	1	hrs/week	

Practicals	2 hrs/week	End Sem. Exam: 70 marks
Credits	5	

Course Objectives:	
1.	To introduce the students for the purpose of measurement.
2.	To provide the knowledge of fundamentals and types of all the sensors and transducers and their signal conditioning used in the industry.
3.	To understand the sensors and transducers concept and its applications in the process measurement.
4.	To give the analysis of various sensors characteristics and their selections in applications in controlling various parameters.
5.	To introduce the students for the purpose of measurement.
6.	To provide the knowledge of fundamentals and types of all the sensors and transducers and their signal conditioning used in the industry.
7.	To understand the sensors and transducers concept and its applications in the process measurement.
Course Outcomes:	
1.	To identify, list, define verity of sensors, signal conditioning devices, transducer (Primary and secondary)
2.	To describe, draw, classify and produced sketches, drawings to explain working principles of various sensors and transducers.
3.	To analyze the problem using basic principles for development of project for agriculture, biomedical, Automobiles, Environmental, Petrochemical or other process industries.
4.	To monitor and evaluate asses and compare of various sensors and transducers and came to conclusion for the best selection for the desired applications.
5.	To create, design, formulate, generate and deliver the solutions for given applications using best applicable sensors and transducers.
Syllabus:	
Unit 1	**General measurement system**
	Measurement system-purpose, structure and elements. Generalized performance characteristics: static characteristics of measurement system elements, dynamic characteristics of measurement systems.
Unit 2	**Variable resistance transducers**
	Potentiometer, strain gauge, types of strain gauge, derivation of gauge factor, bridge configurations, compensation, applications of strain gauges.
Unit 3	**Variable capacitive transducers**
	Capacitance principles, capacitive displacement transducers, capacitive level transducers, capacitive hygrometer, and capacitive proximity transducers.
Unit 4	**Variable inductive transducers:**
	Linear variable differential transformer, rotary variable differential transformer.
Unit 5	**Temperature transducers**
	Resistance temperature detector, thermistor, thermocouple, pyrometers, IC temperature transducers.
Unit 6	**Pressure transducers**
	Manometers, Electrical pressure transducers, Vacuum pressure measurements.
Unit 7	**Flow measurement systems**

	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.
Unit 8	**Level measurement**
	Level formulae; level sensing devices, direct level sensing, indirect level sensing, and application considerations.
Text Books:	
1.	Arun Ghosh, Introduction to Measurements and Instrumentation, PHI Learning Pvt. Ltd., 16-Oct-2012.
2.	Bentley J. P., Principles of measurement systems, Third Edition, Pearson education Asia pvt.ltd, 2000.
3.	A. K. Sawhney, A Course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai and Co. (P) Ltd.,1998
Reference Books:	
1.	Doebelin, E.O., Measurement Systems, McGraw Hill Book Co., 1998
2.	Patranabis D, Sensors and Transducers, Wheeler Publishing Co., Ltd. New Delhi, 1997.
3.	Murthy, D.V.S., Transducers and Instrumentation, Prentice Hall of India Pvt. Ltd., New Delhi, 1995.
4.	Neubert, H.K.P., Instrument Transducers, Clarenden Press, Oxford, 1988.
5.	Process Measurement and Analysis- B. G. Liptak- Butterworth Heinemann- Third Edition.
Term Work:	
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:	
1.	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.

IN202 Electronic Devices and Circuits

Teaching scheme:			**Examination scheme:**
Lectures	3	hrs/week	Theory

Tutorials	1	hrs/week	Mid Term : 30 marks, End Sem. Exam: 70 marks
Practicals	2	hrs/week	
Credits	5		

Course Objectives:	
1.	To train the students the operational principle, analysis, design and application of the diode, transistors.
2.	An understanding of how complex devices such as semiconductor diodes and transistors are modeled and how the models are used in the design and analysis of useful circuits.
3.	Understand the application of different electronic devices and simple circuits.
4.	To develop the students' ability on conducting engineering experiments, analyze experimental observations scientifically.
5.	To analyze simple electronic circuits using simulation software.
Course Outcomes:	
1.	To remember the basic electronic components and observe various characteristics of the same.
2.	To understand the various theorems, utilizing equivalent circuits or developing models and applying the fundamental circuit theorems rather than memorizing the equations.
3.	To practice different biasing circuits using equivalent models to illustrate various circuit parameters.
4.	To analyze and design basic electronic circuits, particularly with application to diodes, MOS field-effect transistors, bipolar junction transistors.
5.	To measure the characteristics of two port network.
6.	To design and construct different electronic circuitry like single-stage amplifier, multi-stage amplifier, oscillator circuits, multivibrators, feedback amplifiers.
Syllabus:	
Unit 1	**Semiconductor diodes and applications**
	Introduction to semiconductors, PN junction diode, forward and reverse biased junctions, V-I characteristics, equivalent circuits, transition and diffusion capacitance. SPICE diode model. Diode rectifier circuits: half-wave, full-wave, and bridge type, rectification efficiency, ripple factor, filter circuits, clipper and clamper circuits. Metal semiconductor contacts, hetero junctions, zener diodes, schottky diode, Photo diode, light-emitting diode (LED), varactor diode, breakdown diodes, Zener diode as a voltage regulator.
Unit 2	**Transistors**
	Introduction to BJT and FET, characteristics and configurations, different modes of operation and configurations. Transistor current components. Ebers – Moll model and Gummel – Poon model of BJTs. Bipolar transistor switch, SPICE BJT model, Punch through and other breakdown mechanisms, photo-voltaic effect, n Photo-cell transistors. DC analysis of BJT and FET, power considerations. DC Load line analysis, operating point, biasing methods, transistor as an amplifier, Single stage CE amplifier, phase reversal, dc and ac equivalent circuits, ac load-line analysis. Amplifier step response and frequency response.
Unit 3	**Multi stage amplifier**
	Classification, distortion, noise, low frequency response of RC coupled and transformer coupled amplifiers.

Unit 4	**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.
Unit 5	**Feedback amplifiers**
	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, Hartley, Colpitt's and crystal oscillators.
Unit 6	**MOSFETs**
	Device structure and physical operation, current – voltage characteristics, DC circuit analysis, MOSFET as an amplifier and as a switch, small signal model, amplifier configurations, DC analysis and small signal analysis. Enhancement and depletion modes of MOSFET, SPICE MOSFET model, CMOS structure, operation, BiCMOS operation, CCDs.
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.
7.	B.G. Streetman, "Solid state devices", 4th Edition, PHI, 1995.
Term work:	
	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, different types of analysis of active and passive circuits.
1.	Study of electronic instruments: Regulated power supply, Function generator, Multimeter, Cathode Ray Oscilloscope (CRO), other instruments: LCR meter, frequency counter, voltmeter, and ammeter.
2.	Study of Electronic components: Resistor, Potentiometer, Trimmer, Capacitors, Inductors, Diodes: p-n junction diode, Zener diode, light emitting diode (LED), Transistors: BJT and FET, transformers, Probes and connecting wires, Breadboard.
3.	To verify diode characteristics: p-n junction diode, zener diode, tunnel diode.
4.	To study IV characteristics of JFET and MOSFET.
5.	To design and implement rectifier circuits: Half wave and full wave rectifier circuits.
6.	To design and implement passive filters: C, RC, LC, CLC etc.
7.	To design and implement zener diode voltage regulator.

8.	To design and implement wave shaping circuits: Clipper circuits.
9.	To design and implement clamper circuits.
10.	To verify input and output characteristics of BJT / FET in various configurations.
11.	To design and implement Transistor BJT / FET amplifier circuit and to study its frequency response.
12.	To design and implement two stage RC coupled amplifier and study its frequency response.
13.	To design and implement emitter follower/Darlington emitter follower and study its performance.
14.	To design and implement class AB push-pull power amplifier.
15.	To design and implement RC phase shift oscillator, Hartley / Colpitts oscillator.
Mini-projects:	
1.	Design and implementation of Regulated DC power supply / Signal generator
2.	Simulation of Electronic circuits using SPICE.
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.

IN207 Circuit Theory

Teaching scheme:			**Examination scheme:**
Lectures	3	hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials			
Practicals	2	hrs/week	
Credits	4		

Course Objectives:	
1.	To develop problem solving skills and understanding of circuit theory through the application of techniques and principles of electrical circuit analysis to common circuit problems.
2.	To develop an understanding of the fundamental laws and elements of electric circuits.
3.	To understand waveforms, signals, and transient, and steady-state responses of RLC circuits.
4.	To develop the ability to apply circuit analysis to DC and AC circuits.
5.	To understand advanced mathematical methods such as Laplace and Fourier transforms along with linear algebra and differential equations techniques for solving problems.
Course Outcomes:	
1.	To remember basic concepts and principles of electrical circuits.
2.	To explain network theorems and their applications.
3.	To solve network problems using mesh current and node voltage equations.
4.	To investigate initial conditions and obtain circuit response using Laplace Transform.

5.	To evaluate network functions and two port parameters for electrical networks.
6.	To analyze electrical circuits using network theorems.
Syllabus:	
Unit 1	**Development of circuit concepts**
	Charge, current, voltage, energy, introduction to basic passive circuit parameters.
Unit 2	**Conventions for describing networks**
	Reference direction for current and voltage, active element convention, source transformation, dot convention for coupled circuits, Topological description of networks.
Unit 3	**Network equations**
	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.
Unit 4	**Initial conditions in networks**
	Use and study of initial conditions in various elements, a procedure for evaluating initial conditions.
Unit 5	**Transform of other signal waveform**
	Shifted unit step function, ramp and impulse function, waveform synthesis, initial and final valve theorem, convolution integral, convolution as a summation.
Unit 6	**Impedance functions and network theorems**
	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.
Unit 7	**Network functions**
	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**.**
Unit 8	**Two-port parameters**
	Relationship of two port variables, short circuit admittance parameters, opens circuit impedance parameters, transmission parameters, hybrid parameters, relationship between parameters sets, and parallel connection of two port networks**.**
Unit 9	**Sinusoidal steady-state analysis**
	Sinusoidal steady-state, the sinusoid and solution using $e^{\pm \omega t}$, phasors and phasor diagrams.
Text /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

Term Work:	
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:	
1.	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.

IN209 Electrical Machines

Teaching scheme:			**Examination scheme:**
Lectures	3	hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials		hrs/week	
Practicals	2	hrs/week	
Credits (Th)	4		

Course Objectives:	
1.	To introduce students with classification of electrical machines.
2.	Introduction of working principle and operation of AC and DC machines.
3.	To teach students different speed control methods of electrical machines.
4.	Helping students in understanding performances of machines under different operating conditions and their testing methodology.
Course Outcomes:	
1.	To know the basic fundamentals of different electrical machines and transformers.
2.	To introduce the different characteristics of D C machines
3.	Investigation of motors starting problems.
4.	To analyse and investigate the major performance characteristics of different types of motors.
5.	To decide what type of motor is selected for this applications and test the motor from the students to gain the proficiency to differentiate between the different types of motors, with the capability to select the proper motor for the proper application.
6.	To construct the machines from the students with the proficiency to conduct and benefit from the testing procedures of electric motors with the ability to analyse data and to solve the problems.
Syllabus:	

Unit 1	**Single phase transformers**
	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 potential transformer, pulse transformer and application.
Unit 2	**Three phase transformers**
	3-Ø transformer, 3-Ø 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-Ø transformer.
Unit 3	**D.C. generator**
	Principle, construction and working of D.C. 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.
Unit 4	**D.C. motor**
	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.
Unit 5	**Induction motor**
	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.
Unit 6	**Synchronous machines**
	Alternators: Basic principles, construction, star and delta connection, equation of induced EMF, alternator on load, vector diagram, voltage regulation, parallel operation of two alternators. **Synchronous motor:** Principle of operation, method of starting, motor on load, effect of increase in load.
Text /Reference Books:	
1.	B. L. Theraja, A. K. Theraja, A Textbook of Electrical Technology, Vol-II, S.Chand& Co., New Delhi, 2005.
2.	I. J. Nagrath, D. P. Kothari, Electric Machines, Tata McGraw Hill Publication. Second Edition, 2003.
3.	A. E. Fitzgerald, C. Kingsley, S. D. Umans, Electrical Machinery, Tata McGraw Hill. Sixth Edition 2002.
4.	J. B. Gupta, Electrical Machines, SK Kataria and Sons, New Delhi.
5.	Ashfaq Hussein, Electrical Machines, Dhanpat Rai Publication, 2012.
6.	P.S. Bhimbra, Electrical Machines, Khanna Publication, 2011.
Term Work:	
1.	To perform Short circuit test of transformer.
2.	To perform open circuit test of transformer.

3.	To determine the characteristics of D.C. Generator.
4.	Study of D.C. Motor starter.
5.	To determine the characteristics of D.C. Motor.
6.	Study of Speed control of D.C. motor.
7.	Load test of Induction motor.
8.	Study of induction motor starters.
9.	Determination of Squirrel cage induction motor performance from Circle diagram.
10.	Direct loading test on three phase Alternator.
11.	Study of Alternator.
12.	Study of synchronous motor.
Practical Examination:	
1.	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.

HS221 Human Values & Professional Ethics

Teaching scheme:			**Examination scheme:**
Lectures	2	hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials		hrs/week	
Credits	2		

Course Objectives:	
1.	Making the students aware and sensitive to value system in real life situations.
2.	To help the students to discriminate between ephemeral and eternal values
3.	To discriminate between essence and form
Syllabus:	
Unit 1	**Course introduction**
	Need, basic guidelines, content and process for value education Understanding the need, basic guidelines, content and process for value education. A look at basic aspirations: self exploration, happiness and prosperity, Fulfillment of human aspirations and harmony
Unit 2	**Understanding the harmony**
	Thoughtful human being harmony, sentient, attitude and its importance in relationship, significance of restraint and health *(Yama and Niyama)*, human goal settings and life management techniques, existence and co-existence, trust, respect in universal order.
Unit 3	**Understanding professional ethics**
	Harmony at various levels and understanding professional ethics, creating environmentally aware engineers, humanistic universal education, natural acceptance of human values, ethical human conduct.
Unit 4	**Competence of professional ethics**
	Management models for present technologies, strategies for integrating humans in family and at all levels of existence, relevance of the above strategies in becoming responsible engineers, technologists and managers.
Unit 5	**Motivation**

	Contribution of ancestors in science and technology development to raise self esteem in Indian context.
Text Books:	
1.	R. R. Gaur, R. Sangal, G. P. Bagaria, A Foundation Course in Value Education, 2009.
2.	A. Nagraj, Jeevan Vidya ek Parichay, Divya Path Sansthan, Amarkantak, 1998.
3.	Sussan George, How the Other Half Dies, Penguin Press. Reprinted 1986, 1991
4.	P. L. Dhar, R. R. Gaur, Science and Humanism, Commonwealth Purblishers, 1990.
5.	A. N. Tripathy, Human Values, New Age International Publishers, 2003.
6.	Subhas Palekar, How to practice Natural Farming, Pracheen (Vaidik) Krishi Tantra Shodh, Amravati, 2000.
7.	Donella H. Meadows, Dennis L. Meadows, Jorgen Randers, William W. Behrens III, Limits to Growth – Club of Rome's report, Universe Books, 1972.
8.	E. G. Seebauer & Robert L. Berry, Fundamentals of Ethics for Scientists & Engineers, Oxford University Press, 2000.
9.	M. Govindrajran, S. Natrajan & V. S. Senthil Kumar, Engineering Ethics (including Human Values), Eastern Economy Edition, Prentice Hall of India Ltd.
10.	Subroto Bagchi, The Professional.
11.	B. P. Banerjee, Foundations of Ethics and Management, Excel Books, 2005.
12.	B L Bajpai, Indian Ethos and Modern Management, New Royal Book Co., Lucknow, 2004, Reprinted 2008.

Semester-IV

MA202(I) Engineering Mathematics-IV (Complex Analysis)

Teaching scheme:		**Examination scheme:**
Lectures	4 hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials		
Credits	4	

Course Objectives:	
1.	To acquaint student with: the basic concepts of complex variables and the function of complex variables. Motivate students to use critical thinking skill to solve practical problems in Engineering and technology.

Course Outcomes:	
1.	Importance of complex variables in finding roots of algebraic equations.
2.	Complex function can be described Fluid flow and mechanical problems In two dimensional potential theory.
3.	Properties of the Analytic functions in Engineering field.
4.	This theory is useful in finding the value of Improper and some real integrals.
5.	To Design and study images under conformal transformations.
6.	Importance of complex variables in finding roots of algebraic equations.

Syllabus:	
Unit 1	Introduction to Complex Variables.
Unit 2	Function of complex variables, limit, continuity , differentiability , Analytic function & its properties, Cauchy-Riemann equation , Harmonic functions, elementary functions.
Unit 3	Line Integral, Cauchy's theorem & Cauchy's Integral formula & its Applications.
Unit 4	Taylors &Laurent's Series expansions.
Unit 5	Residues, Cauchy's Residue Theorem.
Unit 6	Evaluation of Improper Integrals, Conformal mappings.

Text Books:	
1.	Dr. A. R.Shastri , Function Of Complex Variables.
2.	R. K. Jain, S. R. K Iyenger, Advanced Engineering Mathematics.
3.	Erwin Kreyszig, Advanced Engineering Mathematics.
4.	R.V. Churchill and J. W. Brown, Complex Variables & application (seventh edition), Mc Graw Hill(2003).

MA202(II) Engineering Mathematics-IV (Statistics and Probability)

Teaching scheme:		**Examination scheme:**
Lectures	4 hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials		
Credits	4	

Course Objectives:	
	To acquaint students with: The basic concepts of Statistics and Probability. Theory and its methods so that it will help the students in decision making.
Course Outcomes:	
	Basic concepts of Statistics and Probability & Its importance in engineering. By acquiring the Knowledge of these theories, the students are well equipped with the tools of statistics and probabilities. They can apply these techniques to solve the Engineering problems.
Syllabus:	
Unit 1	**Review of statistics**
	Sample data, population dada, measures of central tendencies (mean, mode, median, measures of dispersions, S.D. and variance of sample data and population data), Skewness, Quart sis and moments.
Unit 2	**Probability**:
	Basic concepts, fundamental theorem, conditional probability, independent events, Bay's Theorem.
Unit 3	**Random variable and probability distribution**:
	Discrete and random variable, probability mass function, its mean variance, cumulative distribution function, Binomial, Poisson distributions, Geometric distribution, negative Binomial distribution.
Unit 4	**Continuous random variable:**
	Probability density function, mean and variance, moments, uniform continuous random variable, normal continuous random variable, standard normal random variable.
Unit 5	**Joint probability distribution**:
	Probability mass function of discrete random variables X, Y. marginal distribution of X ,Y. probability density function of random variables, marginal distribution of random variables X , Y. Conditional distribution of discrete/ continuous random variables X, Y.
Reference Books:	
1.	Prem S. Mann, Introduction of statistics.
2.	Erwin Kreyzig, Advanced engineering mathematics.
3.	Ronald E. walpole, Probability and statistics.
4.	William W. Hines, Douglas c. montgomery, david M. goldman and connie m. Borror, Probability and statistics in engineering.

MA202(III) Engineering Mathematics-IV (Numerical Methods)

Teaching scheme:		**Examination scheme:**
Lectures	4 hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials		
Credits	4	

Course Objectives:

	To acquaint students with: the basic concepts of Numerical methods and Techniques. It gives a complete procedure for solving different kinds of problems that occur in Engineering. To motivate students to use critical thinking skill to solve practical problems.

Course Outcomes:

	Basic concepts of Numerical Methods & Techniques and its importance in engineering. By acquiring the Knowledge of these theories, the students can be able to apply the techniques in decision making in Engineering.

Syllabus:

Unit 1	**Introduction**
	Floating point, round-off, error propagation. Solution of equations by iteration. Bisection method, iteration method, Regula-falsi method, Newton-Raphson's method.
Unit 2	**Interpolation**
	Finite differences (Forward, backward, central differences), Newton's forward interpolation formula, Newton's back ward interpolation formula, Lagrange's interpolation formula. Error estimation.
Unit 3	**Numerical integration:**
	Trapezoidal rule, Simpson's one-third rule, Simpson's three-eighth rule, Weddle's rule. Error estimation.
Unit 4	**Linear systems**:
	Gauss elimination method. LU-Factorization, Gauss-Seidel iteration method. Ill conditioning.
Unit 5	**Curve fitting** :
	Method of least squares, curves fitting of linear and parabolic equations, the curves of type y=a b(to power x), y=a x(to power b) and y= a exp(bx).
Unit 6	**Numerical methods for ordinary differential equation:**
	Taylor's series, Picard's method, Euler's method with truncation error, improved Euler's Methods, Runge-Kutta method and Admas-bashforth method.
Unit 7	**Numerical solution of partial differential equations**:
	Introduction, Difference quotients, graphical representation of partial quotients, classification of partial differential equation of second order. Solution of elliptic, hyperbolic and parabolic equations.

Reference Books:

1.	Chapra and Canale, Numerical methods for engineers.
2.	S. S. Shastri, Introduction to numerical methods.
3.	R. K. Jain, Ivengar, P. K. jain, Numerical Methods for Scientific and engineering computation.
4.	Erwin Kreyzig , Advanced engineering mathematics.

MA202(IV) Engineering Mathematics-IV (Discrete mathematics)

Teaching scheme:		**Teaching scheme:**
Lectures	4 hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials		
Credits	4	

Course objectives

	To introduce a number of Discrete Mathematical Structures (DMS) found to be serving as tools even today in the development of theoretical computer science. Course focuses on of how Discrete Structures actually help computer engineers to solve problems occurred in the development of programming languages.

Course Outcomes

	A complete knowledge on various discrete structures available in literature. Realization of some satisfaction of having learnt that discrete structures are indeed useful in computer science and engineering. Gaining of some confidence on how to deal with problems which may arrive in computer science and engineering in near future.

Syllabus:

Unit 1	**Set and propositions**
	Introduction, combinations of sets, finite, infinite and uncountable infinite sets, mathematical induction, principle of inclusion and exclusion, multi sets.
Unit 2	**Relation and function**
	Introduction, properties of binary relations, equivalence relation and partition, partial ordering relations and lattics. job scheduling problems, functions. pigeon hole principle.
Unit 3	**Graph and planer graph**
	Basic terminology, multi-graph and weighted graphs, path and circuits, short path in weighted graphs. Eulerian path and circuits, Hamiltonian path and circuits. Factor's of a graph, planer graph.
Unit 4	**Trees and Cut**
	Trees, rooted trees, path lengths in rooted trees, pre-fixed codes, binary search trees, spanning trees and cut sets, minimum spanning trees. Transport net-work.
Unit 5	**Discrete numeric functions and generating function**
	Introduction, manipulation of numeric functions, Asymtotic-behaviour of numeric functions, generating function.
Unit 6	**Recurrence Relations and Recursive Algorithms**
	Introduction, recurrence relations, linear recurrence relations with constant coefficients, homogeneous solutions, particular solutions, total solution. Solution by the method of generating functions.
Unit 7	**Boolean Algebra**
	Lattices and Algebraic systems, principle of duality, basic properties of algebraic system defined by lattices, Boolean lattices and Boolean algebra.

Reference Books:

1.	C. L. Liu, Elements of Discret Mathematics.
2.	Kennet H. Rosen, Discrete Mathematics.
3.	Erwin Kreyzig, Advanced engineering mathematics.
4.	J. K. Truss, Discrete mathematics for computer Scientists.

IN203 Linear Integrated circuits

Teaching scheme:			**Examination scheme:**
Lectures	3	hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials			
Practicals	2	hrs/week	
Credits	4		

Course Objectives:

1.	To introduce the basic building blocks of linear integrated circuits
2.	To teach the linear and non-linear applications of operational amplifiers
3.	To introduce the theory and applications of analog multipliers and PLL
4.	To teach the theory of ADC and DAC
5.	To introduce a few special function integrated circuits

Course Outcomes:

1.	To understand the operational amplifiers with linear integrated circuits.
2.	To design circuits using operational amplifiers for various applications.
3.	To infer the DC and AC characteristics of operational amplifiers and its effect on output and their compensation techniques.
4.	To Classify and comprehend the working principle of data converters.
5.	To illustrate the function of application specific ICs such as Voltage regulators, PLL and its application in communication.
6.	To compare the working of multivibrators using special application IC 555 and general purpose Op-amp.

Syllabus:

Unit 1	**Integrated circuits**
	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.
Unit 2	**OP-amp with positive and negative feedback**
	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.
Unit 3	**Active filters**
	Frequency response of op-amp. Low pass, high pass first and second order, band pass, band reject and all pass Butterworth filters.
Unit 4	**Introduction to oscillator using op-amps**
	Phase shift oscillator, Wein bridge oscillator, square wave, triangular wave and saw tooth wave generators.
Unit 5	**Comparators and converters**
	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.
Unit 6	**Study of some important IC's**
	555 timer and its applications, The 723 and 78xx and 79xx voltage regulator IC's, PLL IC's 565 and its applications, DAC 0808, ADC 0809.
Unit 7	**Analog computation and simulation**
	Introduction to analysis of linear differential equations, time and magnitude scaling, applications to transfer function simulations.
Text/ 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.
Term Work:	
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:	
1.	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.

IN204 Signals and Systems

Teaching scheme:			Examination scheme:
Lectures	3	hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials	1	hrs/week	
Practicals			
Credits	4		

Course Objectives:	
1.	Understanding the fundamental characteristics of signals and systems.
2.	Development of the mathematical skills to solve problems involving convolution, filtering and sampling.
3.	Coverage of continuous and discrete-time signals and systems, their properties and representations and methods that are necessary for the analysis of continuous and discrete-time signals and systems.
4.	Knowledge of time-domain representation and analysis concepts as they relate to difference equations, impulse response and convolution, etc.
5.	Knowledge of frequency-domain representation and analysis concepts using Fourier Analysis tools, Z-transform

Course Outcomes:	
1.	To know different types of signals and systems and demonstrate an understanding of characteristics of continuous and discrete -time signals and LTI systems.
2.	To understand fundamental properties and behavior of LTI systems and be able to determine response of the system for given input.
3.	To use the tools (e.g. orthogonal transforms: Fourier transform, Laplace transform, z-transform etc.) for analysis and design of an LTI systems.
4.	To analyze the behavior of LTI systems in time and frequency domain using impulse response and transfer function respectively.
5.	To understand the sampling theorem and the limitations of processing the signals digitally.
6.	To design a simple LTI system like low-pass or high-pass filters.

Syllabus:	
Unit 1	**Continuous–Time and Discrete –Time Signals**
	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 Discrete Time Signals in Terms of impulse.

Unit 2	**Continuous-time and discrete-time systems**
	Interconnections of Systems; Basic System Properties (Causality, Stability, Time-Invariance, Linearity, Invertibility, systems with and without, memory).
Unit 3	**Linear time –invariant systems**
	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). Unit step response of an LTI system; LTI systems described by differential and difference equations; block diagram representations; singularity functions.
Unit 4	**Fourier series representation of periodic signals**
	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.
Unit 5	**Continuous-time Fourier transform**
	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.
Unit 6	**Discrete- time Fourier transform**
	Representation of discrete-time a periodic 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.
Unit 7	**Sampling**
	Representation of a continuous–time signal by its samples; sampling theorem; reconstruction of signals from its samples using interpolation; effect of under sampling (frequency domain aliasing); discrete time processing of continuous–time signals.
Unit 8	**Laplace transform**
	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; unilateral Laplace transform; solution of differential equations using the unilateral Laplace transform.
Unit 9	**Z-Transform**
	Z-Transform; 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; unilateral Z-transform; solution of difference equation using the unilateral Z-Transform.
Text Books/ Reference Books:	
1.	A. V. Oppenheim, A. S. Wilsky 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.

IN206 Digital Electronics and Logic Design

Teaching scheme:			**Examination scheme:**
Lectures	3	hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials	1	hrs/week	
Practicals	2	hrs/week	
Credits	5		

Course Objectives:

This course covers topics in the design and analysis of digital circuits. The primary goal is to provide in depth understanding of logic and system synthesis.

1.	To introduce number systems and codes.
2.	To introduce basic postulates of Boolean algebra and to show the correlation between Boolean expressions.
3.	To introduce the methods for simplifying Boolean expressions.
4.	To outline the formal procedures for analysis and design of combinational circuits and sequential circuits.
5.	To introduce the concept of memories, programmable logic devices and digital ICs.

Course Outcomes:

1.	To represent numerical values in various number systems and perform number conversions between different number systems.
2.	To simplify the logic expressions using Boolean laws and postulates, K-map and design them by using Logic gates / MSI chips. Understand the concept of memory, its types and organization, ROM as a PLD.
3.	To design combinational and sequential digital logic circuits. Use electronics tools and test equipment competently. Interpret schematic diagrams and waveforms.
4.	To verify the operation of various combinational logic circuits for commonly used digital functionalities such as Half / full adders, parallel binary /BCD adders, comparators, decoders, encoders, Multiplexers and Demultiplexers.
5.	To design the test bench for combinational and sequential circuits, design of A/D and D/A converters.
6.	To design and implement digital based mini-projects.

Syllabus:

Unit 1	**Fundamentals of digital systems and logic families**
	Digital Signals, digital circuits, NAND and NOR operations, EX-OR operation, Boolean algebra, examples of IC Gates, number systems-binary, signed binary, Octal, hexadecimal numbers, binary and BCD arithmetic, one's and two's complement arithmetic, codes, error detecting and correcting codes, characteristics of digital ICs, digital logic families-RTL, DCPL, I^2L, DTL, HTL, TTL, schottky TTL, ECL, MOS Logic, CMOS Logic, interfacing CMOS and TTL, Tri-state logic.
Unit 2	**Combinational digital circuits**

	Standard representation for logical functions, K-map representation. simplification of logical functions using four, five and six variable K-maps. minimization of logical functions- don't care conditions, logic design using MSI chips- multiplexer, de-Multiplexer/decoders, adders, subtractors, carry look ahead adder, elementary ALU design, popular MSI chips, digital comparator, parity checker /generator, code converters, priority encoders, decoder/drivers for display devices, Quine-McClusky method of function realization.
Unit 3	**Sequential circuits and systems**
	1-Bit memory cell, properties of bistable latch, clocked SR flip flop, J-K, T and D types of flip flop, applications of flip-flops- shift register and counter types, serial to parallel converter, parallel to serial converter, ring counter, sequence generator, serial adder, ripple (asynchronous) counters, synchronous counters, counter design using flip-flops, special counter ICs and applications.
Unit 4	**A/D and D/A converters**
	Digital to analog converter types: weighted resistor and R-2R ladder, specifications for D/A converters, examples of D/A converter ICs, sample and hold circuit. Analog to digital converters: quantization and encoding, parallel comparator A/D converter, types: successive approximation, counting type, single slope and dual Slope A/D converters, A/D converter using voltage to frequency and voltage to time conversion, specifications of A/D converters, example of A/D converter ICs.
Unit 5	**Semiconductor memories and programmable logic devices (PLDs)**
	Memory organization and operation, expanding memory size, classification and characteristics of memory, sequential memory, read only memory (ROM), read and write memory (RAM), content addressable memory (CAM), charge-coupled device memory (CCD), commonly used memory chips, ROM as a PLD, programmable logic array, programmable array logic (PAL) and generic array logic (GAL) devices, complex programmable logic devices (CPLDs)- field programmable gate array (FPGA).
Text Books:	
1.	Jain R.P., Modern Digital electronics, Tata McGraw Hill Edition, 6th Edition2006.
2.	Anand Kumar, Fundamentals of Digital Circuits Prentice-Hall India, 2003.
Reference Books:	
1.	Anand Natrajan, Digital Design, PHI Publication, 2011.
2.	Morris M., Mano, Digital Design, Tata McGraw Hill, 4th edition, 2006.
3.	An Engineering Approach to Digital Design, Fletcher W. I., Prentice Hall of India, New Delhi.1997.
4.	Wakerly J. F., Digital design- Principles and Practices, P H International /Pearson India, 4th edition, 2005.
5.	Samuel C. Lee, Digital Circuits and Logic Design, Prentice Hall of India, New Delhi, 1976.
Term Work:	
1.	Study of Gates.
2.	Verification of Boolean Laws & D Morgan's theorem.
3.	Realization of Combinational Circuits.
4.	Study of Arithmetic Circuits: Half Adder and Full Adder, Sub tractor, BCD Adder/ Sub tractor.

5.	Study of Flip Flops: S-R, J-K, D type, master slave J-K truth tables & K maps.
6.	Design of Flip Flops.
7.	Study of Counters using IC's: Up down, Decade, Synchronous, Binary, BCD counter.
8.	Design of Counters.
9.	Study of Ring Counter, Johnson Counter etc.
10.	Study of MUX & DEMUX and function realization using data selector IC's.
11.	Study of D/A & A/D converters (Any one of each class): R-2R ladder, weighted register method, Successive Approximation, Voltage to frequency conversion.
12.	Design of Combinational circuits using MUX / DEMUX.
13.	Study of Memories.
14.	Design of Decoder driver to drive 7 segment LED display.
Practical Examination:	
1.	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.

IN208 Electrical and Electronic Measurements

Teaching scheme:			**Examination scheme:**
Lectures	3	hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks
Tutorials			
Practicals	2	hrs/week	
Credits	4		

Course Objectives:	
1.	To reveal knowledge of measurement of electrical quantities.
2.	Understanding the construction and operating principles of electrical instruments.
3.	To understand all electrical equipments used for measuring various parameters.
Course Outcomes:	
1.	To remembering the operating principles of common electrical and electronic measuring instruments, devices and circuits, and their application to testing.
2.	To understanding the error sources and explains how their effects can be minimized in particular measurement situations.
3.	To analyze test measurements and circuit performance mathematically in both time and frequency domains.
4.	To apply the basic principles of instrumentation and devices intended for a particular applications.
5.	To evaluate the results of tests and measurements taken from circuitry constructed by the student.
6.	To create human and environmental implications of measurement systems.
Syllabus:	
Unit 1	**Introduction to measurements**
	Measurement, purpose of measurement, experimental data and errors: measurement recording and reporting, graphical representation of data, precision and accuracy, resolution and sensitivity, errors in measurement, statistical evolution of measurement data and errors.

Unit 2	**Analog DC and AC meters**
	PMMC, galvanometer, DC ammeter, DC voltmeter, electrodynamometer type of instruments, analog multimeter, special purpose analog meters, how to use basic meters and meter errors.
Unit 3	**DC bridges**
	D.C bridges: low, medium and precise resistance measurement.
Unit 4	**AC bridges**
	Inductance and capacitance measurements. Detectors in bridge measurement, Wagner ground connections, transformer ratio bridges, digital RCL meter, Q meter.
Unit 5	**Cathode ray oscilloscope**
	Introduction, block diagram of a general purpose CRO, cathode ray tube, focusing device, post deflection acceleration, beam transit time and frequency limitations, oscilloscope time base, oscilloscope amplifiers, attenuators, basic controls, types of sweeps, delay line, display of electrical signals by oscilloscope, basic oscilloscope patterns, measurement of voltage, frequency and phase.
Unit 6	**Electronic instruments**
	Digital voltmeter, digital multimeter, digital frequency meter system, frequency meter accuracy, time and ratio measurement, counter/time/frequency meter, phase measurement.
Unit 7	**Display devices and recorders**
	LED, LCD display, strip-chart recorder, X-Y recorder, 3-D printers.
Term work:	
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.	Digital measurement of phase and frequency.
7.	Study of AC and DC meters.
8.	Measuring current and voltage.
9.	Study of recorders
Text Books:	
1.	David A. Bell, Electronic Instrumentation and Measurements, Second Edition, Prentice Hall, New Jersy, 1994.
2.	Stanley Wolf, Richard Em. Smith, Student Reference Manual for Electronic Instrumentation Laboratories, Prentice-Hall, 1990.
3.	Golding, E. W. and Widdis, F. C., Electrical Measurements and Measuring Instruments, Fifth edition, A. H. Wheeler and Co, 1993.
4.	Baldwin, C.T., Fundamentals of electrical measurements – Lyall Book Depot, New Delhi, 1973.
Reference Books:	
1.	A. K. Sawhney, A course in Electrical and Electronic Measurements and Instrumentation, Dhanpat Rai & Sons, 2002.
2.	J. B. Gupta, Electrical and Electronic Measurements & Instrumentation, S. K.

	Katariya & Sons, 1969.
3.	Kalsi. H.S., Electronic Instrumentation, Tata McGraw Hill, New Delhi, 1995.
Practical Examination:	
1.	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.

HS222 Professional Communication

Teaching scheme:			**Examination scheme:**	
Lectures	2	hrs/week	Theory Mid Term : 30 marks, End Sem. Exam: 70 marks	
Tutorials				
Practicals	2	hrs/week		
Credits	2		Credits(P)	1

Course Objectives:	
1.	To enable students to speak and write English with a good level of proficiency
2.	To build confidence in students to face interview, deliver speech, make presentation and participate in meeting and discussion
3.	To lay a strong foundation on the subject by revising and correcting the basics
Syllabus:	
Unit 1	**Functional grammar**
	Building of a sentence and its components, Tense- the time sense: Present, Past and Future tense with uses and applications, Verbs, Noun, Pronoun, Adjective, Adverb, Prepositions and Conjunctions: classification, identifications, uses and applications Active & Passive voice, direct and indirect speech, clause, principles of effective communication.
Unit 2	**Listening skills**
	Requirements of listening skill, Phonetics and phonology, Articulation of consonants and vowels, Syllables, Weak form stress, Rhythm and intonation, Face to face conversation, Telephonic conversation.
Unit 3	**Reading skills**
	Requirements of reading skill, Reading poetry, Reading prose, Reading article from standard news paper/ magazine.
Unit 4	**Writing skills**
	Paragraph, Resumes, Letters- formal and informal, Circular, Notice, Agendas, Minutes, Reports, E-mail and Blog writing.
Unit 5	**Speaking skills**
	Requirement of speaking skills, grammatical difficulties, practice of public speaking, conversation between /among students or groups on given situations.
Unit 6	**Integration of skills**
	Group discussion, personal interview, debate and Quiz competition, ppt Presentation.
Text Books/ Reference Books	
1.	Essential English Grammar, Raymond Murphy, Cambridge University Press, 1 December, 2007

2.	Oxford English Grammar Course: Advanced, Michael Swan and Catherine Walter, Oxford, 24 February, 2012
3.	Advanced English Grammar, Martin Hewings, Cambridge University Press, 1 December, 2007
4.	Developing Communication Skills, Krishna Mohan and Meera Banerjee, Macmillan India Ltd, New Delhi, 2nd Edition, 2009
5.	Oxford Advanced Learner's Dictionary, 8th Edition
List of Practicals	
1.	Practice of building of sentences and identification of components
2.	Practice the uses and applications of tense
3.	Identification of parts of speech and form changes- use in sentences
4.	Identification of various clauses and their use in sentences
5.	**Listening Skills:** Listen few BBC / Voice of America/ NDTV 24*7 or similar standard Television channel / Radio or any standard talk/discussion available in CD/DVD and answer the given questions/ write the summery
6.	**Reading Skills:** Read few articles from standard news paper The Hindu/ The Times of India / magazine /books and answer the given questions /write the summery
7.	**Writing Skills: (Assignments)** a. Write your own CV b. Write an E-mail c. Write a blog on current topic of discussion d. Write a technical report e. Write a letter f. Comprehension Tests
8.	**Speaking and Integration of Skills** a. Converse on few given situations b. Group Discussions on a given topic c. Debate competition on a given topic d. Quiz competition among few groups of students e. ppt presentation