K. S. R. M. COLLEGE OF ENGINEERING (AUTONOMOUS) KADAPA
Course Structure for B. Tech (Regular) (2015-16)
ELECTRICAL AND ELECTRONICS ENGINEERING (E.E.E)

B. Tech - I Sem

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	1521101	Mathematics-I	BS	3	1	0	30	70	3
2	1521102	Mathematics-II	BS	3	1	0	30	70	3
3	1503103	Engineering Graphics	BS	1	0	3	30	70	3
4	1524104	English - I	BS	4	0	0	30	70	3
5	1505105	Programming in C	ED	3	1	0	30	70	3
6	1501106	Environmental Studies	HS	4	0	0	30	70	3
7	1505107	Programming in C Lab	ED	0	0	3	50	50	2
8	1599108	Engineering Workshop	ED	0	0	3	50	50	2
Total				18	03	09	280	520	22

B. Tech - II Sem

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	1522201	Engineering Physics	BS	3	1	0	30	70	3
2	1521202	Mathematics-III	BS	3	1	0	30	70	3
3	1523203	Engineering Chemistry	BS	3	1	0	30	70	3
4	1524204	English - II	HS	4	0	0	30	70	3
5	1502205	Electrical Circuits	PJ	3	1	0	30	70	3
6	1525206	Human Values & Professional Ethics	HS	4	0	0	30	70	3
7	1524207	English Language and Communication Skills Lab	HS	0	0	3	30	70	2
8	1599208	Physics & Chemistry Lab	BS	0	0	3	50	50	2
Total				18	04	6	280	520	22

B. Tech – III Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	1521301	Mathematics-IV	BS	3	1	0	30	70	3
2	1511302	Fluid Mechanics & Hydraulic Machinery	PN	4	0	0	30	70	3
3	1504303	Electronic Devices and Circuits	PJ	4	0	0	30	70	3
4	1502304	Electromagnetic Fields	PJ	3	1	0	30	70	3
5	1502305	Network Theory	PJ	3	1	0	30	70	3
6	1502306	Electrical Machines - I	PJ	3	1	0	30	70	3
7	1511307	Fluid Mechanics & Hydraulic Machinery Lab	PN	0	0	3	50	50	2
8	1502308	Electrical Circuits and Simulation Lab	PJ	0	0	3	50	50	2
Total				20	04	06	280	520	22

B. Tech – IV Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	1514401	Analog Electronic Circuits	PJ	3	1	0	30	70	3
2	1504402	Switching Theory & Logic Design	PJ	3	1	0	30	70	3
3	1502403	Generation of Electrical Power	PJ	3	1	0	30	70	3
4	1502404	Electrical & Electronics Measurements	PJ	3	1	0	30	70	3
5	1502405	Electrical Machines - II	PJ	3	1	0	30	70	3
6	1502406	Power Systems - I	PJ	3	1	0	30	70	3
7	1514407	Electronic Devices and Circuits Lab	PJ	0	0	3	50	50	2
8	1502408	Electrical Machines – I Lab	PJ	0	0	3	50	50	2
Total				18	06	06	280	520	22

B. Tech – V Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	1525501	Managerial Economics And Financial Analysis	HS	3	1	0	30	70	3
2	1502502	Control Systems	PJ	3	1	0	30	70	3
3	1502503	Power Electronics	PJ	3	1	0	30	70	3
4	1502504	Power Systems - II	PJ	3	1	0	30	70	3
5	1502505	Electrical Machines - III	PJ	3	1	0	30	70	3
6		**CBCC - I**	PJ	3	1	0	30	70	3
	1514506	Digital Signal Processing	PJ	3	1	0	30	70	3
	1514507	Signals & Systems	PJ	3	1	0	30	70	3
	1514508	Embedded Systems	PJ	3	1	0	30	70	3
7	1502509	Electrical Measurements Lab	PJ	0	0	3	50	50	2
8	1502510	Electrical Machines – II Lab	PJ	0	0	3	50	50	2
Total				18	06	06	280	520	22

B. Tech – VI Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	1514601	Linear & Digital Integrated Circuit Analysis	PJ	3	1	0	30	70	3
2	1514602	Micro Processors & Microcontrollers	PJ	3	1	0	30	70	3
3	1502603	Power Semiconductor Drives	PJ	3	1	0	30	70	3
4	1502604	Power Systems - III	PJ	3	1	0	30	70	3
5	1502605	Power System Operation & Control	PJ	4	0	0	30	70	3
6		**CBCC - II**							
	1514606	Instrumentation	PN	3	1	0	30	70	3
	1502607	Soft Computing Techniques	PN	3	1	0	30	70	3
	1513608	Optimization Techniques	PN	3	1	0	30	70	3
7	1524609	Advanced English communication Lab(Audit Course)	HS	0	0	3	50*	-	-
8	1502610	Power Electronics & Simulation Lab	PJ	0	0	3	50	50	2
9	1502611	Control Systems & Simulation Lab	PJ	0	0	3	50	50	2
Total				19	05	09	280	520	22

B. Tech – VII Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	1525701	Management Science	HS	3	1	0	30	70	3
2	1502702	Advanced Control Systems	PJ	3	1	0	30	70	3
3	1502703	HVDC Transmission	PJ	3	1	0	30	70	3
4	1502704	Switch Gear & Protection	PJ	3	1	0	30	70	3
5	1502705	Electrical Distribution Systems	PJ	3	1	0	30	70	3
6		**MOOC - I**							
	1502706		PJ	3	1	0	30	70	3
	1502707		PJ	3	1	0	30	70	3
	1502708		PJ	3	1	0	30	70	3
7	1514709	Micro Processors & Micro Controllers Lab	PJ	0	0	3	50	50	2
8	1502710	Power Systems Simulation Lab	PJ	0	0	3	50	50	2
Total				20	06	06	280	520	22

B. Tech – VIII Semester

S. No.	Subject Code	SUBJECT	SC	L	T	P	IM	EM	CR
1	1502801	Utilization of Electrical Power	PJ	3	1	0	30	70	3
2	1502802	FACTS	PJ	3	1	0	30	70	3
3	1502803	Energy Auditing and Demand Side Management	PJ	3	1	0	30	70	3
4		**MOOC - II**							
	1502804		PJ	3	1	0	30	70	3
	1502805		PJ	3	1	0	30	70	3
	1502806		PJ	3	1	0	30	70	3
5	1502807	Seminar	PJ	0	0	-	50	-	2
6	1502808	Comprehensive Viva	PJ	0	0	-	50	-	2
7	1502809	Project Work	PJ	0	0	-	50	50	10
Total				12	4	0	270	330	26

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1525501	PJ	Managerial Economics and Financial Analysis	3	1	0	30	70	3

OBJECTIVES:

- To equip the budding engineering student with an understanding of concepts and tools of economic analysis.
- Provide knowledge of managerial economics through differential economics concepts, accounting concepts are necessary to analyze and solve complex problems relating financial related matters in bog industries.
- An understanding of professional and ethical responsibility and ability to communicate effectively.
- The broad education necessary to understand the impact of engineering solutions in a global and societal context.
- Recognition of the need for, and an ability to engage in life-long learning and to meet contemporary issues.

UNIT – I: INTRODUCTION TO MANAGERIAL ECONOMICS

Definition, nature and scope of Managerial Economics – relation with other disciplines. Demand analysis – Determinants, Law of Demand and its exceptions – Elasticity of Demand – Types and Measurement of Elasticity of Demand – Methods of Demand Forecasting.

UNIT – II: THEORY OF PRODUCTION AND COST ANALYSIS

Production Functions: Law of variable proportion, Isoquants and Isocost, least cost combination of inputs, Returns to Scale and Cobb- Douglas production function. Internal and external economies of scale.

Cost Analysis: Cost concepts – Break-Even Analysis (BEA) – Break Even Point – significance and limitations of BEA.

UNIT – III: INTRODUCTION TO MARKETS AND PRICING

Markets structures: Perfect and Imperfect competition – Features of Perfect Competition, Monopoly, Monopolistic Competition and Oligopoly. Price- Output determination under perfect competition, monopoly and monopolistic competition – Price rigidity in Oligopoly. **Methods of pricing:** Cost plus pricing, marginal cost pricing, skimming pricing, penetration pricing, differential pricing and administrative pricing.

UNIT – IV: BUSINESS ORGINATIONS AND CAPITAL BUDGETING

Business Organizations: Types of business organizations- Sole Proprietorship, Partnership, Joint Stock Company, Public Ltd and Private Ltd companies, Public Private Partnership (PPP).

Capital Budgeting: Types of capital, methods and sources of raising Capital. Capital Budgeting Techniques: Payback Period Method, Accounting Rate of return (ARR) and Net Present Value Method (NPV) (simple problems).

UNIT – V: FINANCIAL ACCOUNTING AND ANALYSIS

Double Entry Book keeping, Journal, Ledger, Trail Balance – Final Accounts (Preparation of Trading Account, Profit and Loss Account and Balance Sheet without adjustments). Analysis and interpretation of financial statements through ratios (Liquidity, Profitability and Activity Ratios) (Simple problems).

TEXT BOOKS:

1. Varshney & Maheswari: Managerial Economics, Sultan Chand Publishers, 2009.
2. Prasad and K.V.Rao: Financial Accounting, jaibharth Publishers, Vijayawada.

REFERENCES:

1. P.L Mehtha: Managerial Economics, Sulthan Chand Publishers
2. K K Dewett - Managerial Economics ,S. Chand Publishers
3. S.P Jain & K.L Narang: Financial Accounting, Kalyani publishers.
4. M.Sugunatha Reddy: Managerial Economics and Financial Analysis, Research India Publication, New Delhi, 2013.

COURSE OUTCOMES:

- Expected to achieve the overall course objective to understand and enhancing the knowledge regarding managerial concepts and obtaining optimal solutions. And to get an idea of analysis of firm's financial position with the techniques of financial analysis and ratio analysis.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502502	PJ	Control Systems	3	1	0	30	70	3

Objective:
In this course it is aimed to introduce to the students the principles and applications of control systems in everyday life. The basic concepts of block diagram reduction, time domain analysis solutions to time invariant systems It also deals with the different aspects of stability analysis of systems in frequency domain and time domain and to design compensators in frequency domain to improve the performance.

UNIT – I
Control System Concepts: Introduction to Control Systems, Classification. Transfer function, Effect of feedback, mathematical modelling of Physical Systems, block diagram, reduction techniques – signal flow graphs and mason's gain formula. Transfer function of simple electrical systems.
UNIT – II
Time Domain Analysis: Standard test signals, Time response of first and second order systems- Time response specifications – Steady state error and error Constants- Response of P, PI, and PID Controllers.
UNIT – III
Concept of Stability and Root Locus: The Concept of Stability, necessary Conditions for stability – Routh Hurwitz's Criterion – Limitations of Routh's stability – Root Locus Concept – Construction of Root Loci, Effect of Poles & Zeros on stability.
UNIT – IV
Frequency Domain Analysis: Introduction, Correlation between time and frequency response, Frequency domain Specifications. Bode Plots, Nyquist stability Criterion - Gain and Phase margin.
UNIT – V
Compensation Techniques for Linear Control Systems: System Design and Compensation – Realization of basic lead, lag and lead – lag cascade Compensations in frequency domain.
COURSE OUTCOMES: On successful completion of this course, the students will be able to
1. demonstrate knowledge on
   - modelling of physical systems
   - time and frequency domain specifications used for stability analysis.
   - various methods of determining the stability of the system
   - realization of various compensators
2. analyze the stability of the system in time and frequency domains.
3. Design
   - lag, lead, lag-lead compensators in frequency domain.

4. Evaluate

- the transfer function using block diagram reduction technique and signal flow graph.
- steady state error and static error constants.
- system stability in time and frequency domains.

Text Books:

1. "Control Systems Engineering" by I. J. Nagrath and M. Gopal, New Age International (P) Limited, Publishers, 5th edition, 2007.
2. "Automatic Control Systems" by B. C. Kuo and Farid Goinaraghi – John Wiley and Son's, 8th edition, 2003.
3. "Control Systems" by A. Anand Kumar, Prentice Hall of India Pvt. Ltd.

Reference Books:

1. "Modern Control Engineering" by Katsuhiko Ogata, Prentice Hall of India Pvt. Ltd., 5th edition, 2010.
2. "Control Systems Engineering" by NISE, 5th edition, John Wiley.
3. "Modern Control Systems" by C. Dorf, Robert H.Bishop, 12th edition, Pearson New International Edition.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502503	PJ	Power Electronics	3	1	0	30	70	3

Objective:

With the advent of semiconductor devices, revolution is taking place in the power transmission distribution and utilization. This course introduces the basic concepts of power semiconductor devices, converters, choppers and inverters and their analysis.

UNIT – I

SCR – Static Characteristics –Turn ON and OFF mechanism – Gate Characteristics – Dynamic Characteristics – series and parallel operation of SCR's – Static and dynamic equalization circuits – Design of Snubber circuit – ratings – Line Commutation and Forced Commutation circuits.

UNIT – II

Phase controlled Rectifiers – Single Phase half and fully Controlled converters – Midpoint and Bridge Connections with R and RL Loads – Effect of Source Inductance- Single phase and three phase half and fully controlled Converters with R load - Single phase and three phase dual Converters with R and RL loads- Numerical Problems.

UNIT – III

AC Voltage Controllers- Single Phase AC voltage controllers with SCR and TRIAC for R and RL Load – Cyclo Converters – Single Phase Cyclo Converters (mid-point and bridge configuration) with R and RL Loads.

UNIT – IV

Choppers – Principle of Operation – Control Strategies- Types of chopper Circuits – Type A, Type B, Type C, Type D and Type E Chopper Circuits - Multiphase Chopper Circuits – Buck -Boost Converter, Problems.

UNIT – V

Inverters – Single Phase Inverter – Basic Series Inverter – Basic Parallel Capacitor Inverter – Bridge Inverter – Current Source Inverter - Forced commutation Circuits for Bridge inverters – Output Voltage control Techniques- PWM Techniques- Space Vector Modulation - Harmonic reduction techniques.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

1. demonstrate potential knowledge on
   - the characteristics of various power transistors.
   - operation, switching characteristics, ratings, protection and combinations of SCR.
   - various triggering methods and commutation techniques for SCR.
   - operation of line commutated converters and SCR based force commutated converters.
2. analyze the performance of different power converters subjected to various loads.
3. design static and dynamic equalizing circuits, snubber circuits and commutating elements.
4. Evaluate
   - number of SCRs required for desired series /parallel operation,

- electrical parameters and different variables of various power electronic circuits.

Text Books:

1. Power Electronics – By M.D Singh & K.B. Kanchandhani, Tata McGrawHill Publishing Company, 1998.
2. Power Electronics - Circuits, Devices and Applications – by M.H. Rashid, Prentice Hall of India, 2nd Edition 1998.
3. Power Electronics- by PS Bimbhra, Khanna Publications.

Reference Books:

1. Power Electronics – By Vedam Subramanyam, New Age Information Limited, 3rd Edition.
2. Power Electronics – By V.R. Murthy, Oxford University Press, 1st Edition – 2005
3. Power Electronics – By P.C Sen, Tata Mc Graw Hill Publishing.
4. Thyristorised Power Controllers – By G.K. Dubey, S. R. Doradla, A. Joshi and R. M. K. Sinha, New Age Informational(p) Limited Publishing 1996.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502504	PJ	Power Systems - II	3	1	0	30	70	3

Objective:

This course is an extension of Power systems – I. It deals with performance of transmission lines and its modelling, Short Circuit Analysis and Earthing.

UNIT I

Performance of Transmission Lines - Classification of Transmission lines – Short, Medium and Long Line and their model representation – Estimation of regulation and efficiency by Nominal T, Nominal Π and Rigorous Methods - Problems. Equivalent T and Π, Surge Impedance Loading, Ferranti Effect.

UNIT II

System Modeling – Representation of Power System Components– Per Unit Representations and Advantages – Single Line Diagram Representation – Impedance and Reactance Diagram – Changing the Base of Per Unit Quantities.

UNIT III

Symmetrical Fault Studies - Introduction to symmetrical fault analysis – Short circuit capacity of a bus – The short circuit currents and the reactance of synchronous machines – Internal voltages of loaded machines under transient conditions – Expressions for fault MVA in terms of per unit and percentage quantities – Need for current limiting reactors and their location.

UNIT – IV

Unsymmetrical Fault Studies - Symmetrical components – phase shift of symmetrical components in Star-Delta transformer banks – Power in terms of symmetrical components –Sequence impedances and Sequence Networks of Synchronous Machines, Transmission Lines, Transformers – Zero Sequence Networks of 3 Phase Loads and 3 Phase Transformer Banks – Unsymmetrical Fault Analysis on unloaded generator and on power systems with and without fault impedance.

UNIT V

Power System Earthing – Objectives, Definitions, Tolerable Limits of Body Currents – Soil Resistivity – Earth Resistance- Tolerable Step and Touch Potential–Neutral Earthing – Ungrounded and Effectively Earthed System – Types of Earthing, Grounding through an Earthing Transformer.

COURSE OUTCOMES: On successful of the course, student will be able to

1. demonstrate knowledge on
   - Transmission line parameters and their performance.
   - Per unit system, single line diagrams, reactance and impedance diagrams.
   - Importance of earthing
2. analyze
   - modeling of power system components
   - Different types of faults in power systems
3. design
   - location of current limiting reactors.
   - Earthing grid for power systems.
4. exhibit skills in
   - evaluating the parameters and performance of transmission lines.
   - evaluating the fault currents and fault levels.

Text Books:

1. Modern power System analysis – by I. J. Nagarth and D. P. Kothari, TMH, 2nd Edition.
2. Elements of power system analysis, William. D. Stevenson, 4th Edition Jr., MGH
3. A course in Power Systems by J. B. Gupta, S. K. Kataria & Sons, 11th Edition, 2013.

Reference Books:

1. Electrical power systems by C. L. Wadhwa, New Age International publications.
2. Power system analysis by Hadi Saadat, MGH International.
3. Power system analysis by AR Bergen and Vijay Vittal, Pearson education Asia, 2001.
4. Power System Analysis & Design by B.R. Guptha, S.Chand & Company

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502505	PJ	Electrical Machines - III	3	1	0	30	70	3

Objective:

This subject is an extension of previous machines courses. It deals with the detailed analysis of Synchronous generators and motors which are the prime source of electrical power generation and its utilities. Also concerns about the different types of single phase motors which are having significant applications in house hold appliances and control systems.

UNIT-I

Synchronous Generators: Constructional details of synchronous machines, armature windings, distribution, pitch and winding factors - EMF equation, effect of harmonics-suppression of harmonics; armature reaction, concept of leakage flux, synchronous reactance, equivalent circuit, phasor diagram, voltage regulation, determination of regulation by synchronous impedance method, MMF method, ZPF method.

UNIT-II

Theory of salient pole machines, phasor diagrams, and determination of X_d and X_q from slip test, expression for power output of salient pole and cylindrical pole synchronous generators, power angle characteristics, Synchronizing power and torque.

UNIT-III

Parallel Operation of Synchronous Generators: conditions for parallel operations, synchronizing, load sharing, operation of alternator with infinite bus bars- effect of change of mechanical input, effect of change of excitation. Analysis of short circuit current waveform- determination of transient and sub-transient reactances.

UNIT-IV

Synchronous Motors: Principle of operation, methods of starting, Phasor diagram of synchronous motor, variation of current and power factor with excitation, Hunting and use of damper bars. Synchronous condenser and power factor correction.

UNIT-V

1-ø Motors:

Induction Motor: Introduction - production of torque – double field revolving theory – cross field theory – equivalent circuit – determination of equivalent parameters-problems - Starting Methods – Resistance & Capacitance Split phase and shaded Pole - speed control of single phase induction motor - comparison between single phase and three phase induction motors.

Synchronous motors: Principle of operation of Reluctance Motor & Hysteresis Motor

COURSE OUTCOMES: On successful completion of the course, student will be able to

1. demonstrate knowledge on
    - Constructional details, working, characteristics and performance of a synchronous machines, fractional kilowatt motors.
    - armature reaction, regulation and synchronization of alternators.

- Performance of salient pole machines
- starting methods of synchronous motor and its performance evaluation using circle diagrams.

2. analyze the operation of synchronous and single phase machines for various operating conditions.
3. evaluate the performance and various parameters of synchronous machines and fractional kW motors.
4. identify a suitable machine for domestic and industrial applications.

Text books:

1. Electric Machines by I. J. Nagrath and D. P. Kothari, TMH Publishers, 4th Edition 2010.
2. Electrical Machines by P. S. Bimbhra, Khanna Publishers.
3. Electrical Machines by Abhijit Chakrabarti, Sudipta Debnath, Mc GrawHill Education (INDIA) Private Limited.

Reference Books:

1. Theory of Alternating Current Machinery by Langsdorf, TMH Publishers, 2nd Edition
2. Electromechanics – III (Synchronous and Single Phase Machines) by S. Kamakashiah, Overseas Publishers Private Ltd.
3. Electrical Machines by M. S. Sarma and M. K. Pathak, CENGAGE Learning.
4. The Performance and Design of AC Machines, M. G. Say, ELBS and Pitman & Sons.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1514506	PJ	Digital Signal Processing	3	1	0	30	70	3

Course Objectives:

- To become familiar with Discrete Fourier Transform and its efficient computation.
- To understand various IIR and FIR realization techniques.
- To know the design of IIR and FIR filters.

Learning Outcomes:

- Get the knowledge of discrete time signals and systems
- Apply Z-Transforms in digital system design
- Write algorithms for Fast Fourier Transforms
- Realize Digital Filters
- Design IIR and FIR filters for the desired characteristics.

UNIT-I

Introduction: Definition and Classification of Signals, Elementary signals, Basic operations on signals.

Discrete-time signals: sequences, Discrete-time systems, Linear-time invariant systems and its properties**,** linear constant coefficient difference equations, Frequency-domain representation of discrete-time signals and systems

UNIT-II

Discrete Fourier Transform: The Fourier Transform of periodic signals, sampling the Fourier transform, the discrete Fourier transform, properties of DFT, linear convolution of sequences using DFT.

Fast Fourier Transforms: Efficient computation of the DFT, Decimation in time and decimation in frequency FFT algorithms, Implementation of FFT algorithms and FFT algorithms for composite N.

UNIT-III

Z–Transforms: Introduction, The z-transform, properties of the Region of Convergence for the z-transform, The Inverse z-transform, z-transform properties, the inverse z-transform using contour integration.

Realization of Digital Filters: Block diagram representation of linear constant-coefficient difference equations, basic structures of IIR filters- direct form I, direct form II, transposed form, cascade form, parallel forms, basic structures of FIR filters-Direct form, Cascade form, Linear phase structure, Lattice structures.

UNIT-IV

IIR Digital Filters: General considerations-Causality and its implications, Characteristics of Practical Frequency-selective filters, IIR filter design by Impulse Invariance, Bilinear transformation, Design of IIR filters from analog filters-Butterworth and chebyshev approximations, design examples: frequency transformations, Illustrative Problems.

UNIT-V

FIR Digital Filters: Symmetric and Anti-symmetric FIR filters, Design of Linear Phase FIR digital filters using windows, Frequency sampling technique, comparison of IIR and FIR filters, Illustrative Problems, applications of DSP (Dual Tone Multfrequency signal detection, Spectral analysis of sinusoidal and nonstationary signals).

Text Books:

1. A.V.Oppenheim and R.W. Schaffer, & J R Buck, "Discrete Time Signal Processing," 2nd ed., Pearson Education, 2012.
2. John G. Proakis, Dimitris G. Manolakis, "Digital signal processing, principles, Algorithms and Aapplications", Pearson Education/PHI, 4th Edition, 2007.
3. Sanjit K Mitra, "Digital signal processing", A computer base approach- Tata McGraw-Hill, 3rd Edition, 2009.

Reference Books:

1. Andreas Antoniou, Digital signal processing: Tata McGraw-Hill, 2006.
2. Digital signal processing: M H Hayes, Schaum's Outlines, Tata McGraw-Hill, 2007.
3. A. Anand Kumar, "Digital Signal Processing," PHI Learning, 2011.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1514507	PJ	SIGNALS AND SYSTEMS	3	1	0	30	70	3

Course Objectives:

- The objective of the course is to analyze the response of linear, time-invariant dynamic systems to standard input signals.
- To Study the different standard signals that can be applied to the various systems for the estimation of their performance.

Learning Outcomes:

- Get acquaintance with Frequency domain representation of different types of signals which is essential to analyze and design advanced communication systems.
- Apply the Laplace transform to analyze and design continuous-time and discrete-time signals and systems.
- Use the knowledge of Discrete Time Signals and Systems in digital signal processing applications
- Develop mathematical skills to solve problems involving convolution, filtering, modulation and sampling**.**

UNIT-I

Introduction: Definition and Classification of Signals, Elementary signals, Basic operations on signals.
Fourier series representation of periodic signals: Analogy between vectors and signals, Orthogonal signal space, Signal approximation using orthogonal functions, Mean square error, Closed or complete set of orthogonal functions, Orthogonality in complex functions. Representation of function by a set of mutually orthogonal functions, Dirichlet's conditions, Trigonometric Fourier series and Exponential Fourier series, Spectrum and its significance, Amplitude and Phase spectra.

UNIT-II

Fourier transforms: Fourier transform(FT), Fourier transform of standard signals, properties of Fourier transforms, Fourier transforms involving impulse function, Fourier transform of periodic signals,

UNIT-III

Signal transmission through LTI systems: Systems, Classification of Systems, Linear time invariant (LTI) system, Transmission of signals through LTI systems, Transfer function of a LTI system. Distortion less transmission through LTI system, Causality & Stability.

UNIT-IV

Discrete Time Signals: Sampling of continuous time signals, Sampling theorem, Reconstruction of signal from its samples, effect of under sampling – Aliasing. Representation of discrete time signals, Unit impulse, step, ramp, and exponential sequences, Operations on Discrete-time signals.
Discrete Time Systems: Definition, classification, Linear Shift Invariant(LSI) system, Stability , Causality , Linear constant coefficient difference equation , Impulse response , Discrete time Fourier transform , Transfer function , System analysis using DTFT.

UNIT-V

Laplace Transform: Definition , ROC , Properties , Inverse Laplace transform , The S-plane and BIBO stability , Transfer functions , System response to standard signals.

Z–Transforms: Z-transform- definition, ROC and its properties, analysis of LTI system using z-transform, The Inverse z-transform, z-transform properties.

Text Books:

1. Simon Haykin, "Communication Systems", 2nd Edition, Wiley-Eastern, 2003.
2. Oppenheim AV and Willisky, "Signals and Systems", 2nd Edition, Pearson Ed, 1997.
3. B.P. Lathi, "Principles of Linear systems and signals," Oxford Univ. Press, Second Edition International version, 2009.

Reference Books:

1. Simon Haykin, Van Veen, and Wiley, "Signals & Systems", 2nd Edition, 2003.
2. Luis F. Chaparro, "Signals and Systems using MATLAB," Academic Press, 2011.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1514508	PJ	EMBEDDED SYSTEMS	3	1	0	30	70	3

Course Objectives:

- The main objective of the course is to get students familiar with the typical problems and constraints that arise when designing and developing embedded systems
- The course will also introduce theoretical and practical solutions to these typical problems that the students are expected to master and be able to apply to realistic case studies.

UNIT I

Introduction: History of Embedded Systems, Major Application Areas of Embedded Systems, Purpose of Embedded Systems, Core of the Embedded System, Sensors and Actuators, Communication Interface, Embedded Firmware.
Hardware Software Co-Design and Programme Modelling: Characteristics of an Embedded System, Quality Attributes of Embedded Systems, Fundamental Issues in Hardware Software Co-Design, Computational Models in Embedded Design, Introduction to Unified Modeling Language (UML),Hardware Software Trade-offs.

UNIT II

Real-Time Operating Systems (RTOS) Based Embedded System Design: Operating System Basics, Types of Operating Systems, Tasks, Process and Threads, Multiprocessing and Multitasking, Task Scheduling, Threads, Processes and Scheduling :Putting them Altogether, Task Communication, Task Synchronization, Device Drivers, How to Choose an RTOS.

UNIT III

Devices and Communication Buses for Devices Network: IO Types and Examples, Serial Communication Devices, Parallel Device Ports, Sophisticated Interfacing Features in Device Ports, Wireless Devices, Timer and Counting Devices, Watchdog Timer, Real Time Clock, Networked Embedded Systems, Serial Bus Communication Protocols, Parallel Bus Device Protocols- Parallel Communication Network Using ISA, PCI, PCI-X and Advanced Buses, Internet Enabled Systems- Network Protocols, Wireless and Mobile System Protocols.

UNIT IV

Real Time Operating Systems: Process Management, Memory Management, Device, File and IO Subsystems Management, Interrupt Routines in RTOS Environment and Handling of Interrupt Source Calls, Real-time Operating Systems, Basic-Design an RTOS, RTOS Task Scheduling Models, Interrupt Latency and Response of the Tasks as Performance Matrices, OS Security Issues.

UNIT V

Design Examples and Case Studies of Progam Modeling and Programming With RTOS-2: Case study of Communication between Orchestra Robots, Embedded Systems in Automobile, Case study of an Embedded System for an Adaptive Cruise Control(ACC) System in a Car, Case study of an Embedded System for a Smart Card, Case study of a Mobile Phone Software for Key Inputs.

Text Books:

1. Introduction to Embedded System- Shibu KV, Mc-Graw Hill Higher Edition.
2. Embedded Systems Architecture, Programming and Design- Raj Kamal, Second Edition, McGraw-Hill Companies.
3. Embedded System Design by Peter Marwedel, Springer.

Reference Books:

1. Embedded System Design – A Unified Hardware/Software Introduction-Frank Vahid, Tony D. Givargis, John Wiley, 2002.
2. Embedded/ Real Time Systems-KVKK Prasad, Dreamtech Press, 2005.
3. An Embedded Software Primer- David E. Simon, Pearson Ed. 2005.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502509	PJ	Electrical Measurements Lab	0	0	3	50	50	2

The following experiments are required to be conducted as compulsory experiments:

1. Calibration and Testing of Single Phase Energy Meter.
2. Calibration of Dynamometer Power Factor Meter.
3. Crompton D.C. Potentiometer – Calibration of PMMC Ammeter and PMMC Voltmeter.
4. Kelvin's Double Bridge – Measurement of Resistance – Determination of Tolerance.
5. Measurement of % Ratio Error and Phase Angle of given C. T. by comparison.
6. Schering Bridge & Anderson Bridge.
7. Measurement of 3 Phase Reactive Power with Single Phase Wattmeter.
8. Measurement of Parameters of a Choke using 3 Voltmeter and 3 Ammeter Methods.

In addition to the above eight experiments, at least any two of the experiments from the following list are required to be conducted.

9. Optical Bench – Determination of Polar Curve Measurement of MHCP of Filament Lamps.
10. Calibration LPF Wattmeter – by Phantom Testing.
11. Measurement of 3 Phase Power with Two Wattmeter Method (Balanced & Unbalanced).
12. Dielectric Oil Testing using H. T. Testing Kit.
13. LVDT and Capacitance Pickup – Characteristics and Calibration.
14. Resistance Strain Guage – Strain Measurements and Calibration.
15. Transformer Turns Ratio Measurement using A.C. Bridge.
16. A. C. Potentiometer – Calibration of AC Voltmeter, Parameters of Choke.

COURSE OUTCOMES: On successful completion of this course, the students will be able to

1. demonstrate knowledge on
   - measurement of Passive elements in AC and DC Bridges.
   - measurement of power, power factor and energy.
   - Calibration of voltmeter and ammeter
2. Evaluate the parameters of choke coil and dielectric strength of transformer oil.
3. application of different measuring instruments in the field of electrical engineering.
4. function effectively as individual and as member in a team.
5. communicate effectively both oral and written.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502510	PJ	Electrical Machines – II Lab	0	0	3	50	50	2

The following experiments are required to be conducted as compulsory experiments:

1. O.C. & S.C. Tests on Single Phase Transformer
2. Sumpner's Test on a pair of Single Phase Transformers
3. Scott Connection of Transformers
4. No-load & Blocked rotor Tests on Three Phase Induction Motor
5. Regulation of a Three –Phase Alternator by Synchronous Impedance & M.M.F. Methods
6. V and Inverted V Curves of a 3 Phase Synchronous Motor
7. Equivalent Circuit of a Single Phase Induction Motor
8. Determination of X_d and X_q of a Salient Pole Synchronous Machine

In addition to the above eight experiments, atleast any two of the following experiments are required to be conducted from the following list:

1. Parallel Operation of Single Phase Transformers
2. Separation of Core Losses of a Single Phase Transformer
3. Brake test on Three Phase Induction Motor
4. Regulation of Three Phase Alternator by Z.P.F. Method

COURSE OUTCOMES: On successful completion of the course, student will be able to

1. demonstrate knowledge on identification of parts of transformers and AC machines.
2. analyze the performance of Transformers and AC machines.
3. design the experimental circuit based on loading and rating of the transformers and AC machines.
4. demonstrate skills in
   - obtaining the various characteristics of Transformers and AC machines.
   - determining the performance characteristics of Transformers and AC machines.
   - Determining and separation of losses in Transformers and AC machines.
5. function effectively as an individual and as member in a team.
6. communicate effectively both oral and written.

TEXT BOOKS:

1. Electrical Machines Lab manual with MATLAB Programs by Dr. D. K. Chaturvedi, Univ. Science Press.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1514601	PJ	Linear and Digital Ic Applications	3	1	0	30	70	3

Course Objectives:

- To give introduction to Op-Amps
- To study about Timers and PLLs
- To Learn the applications of Op-Amps.
- To introduce VHDL and its language elements to design digital systems.
- Make students familiar with design of different combinational and sequential digital circuits.

Learning Outcomes:

- Apply OP-AMPs in various IC applications
- Use the knowledge of DC and AC characteristics of operational amplifiers that are essential in design and simulation of analog systems and subsystems
- Apply multivibrator circuits using OP-AMPs and 555 timers and study the applications of Phase Locked Loops in Communication Systems.
- Able to use computer-aided tools for development of complex digital logic circuits
- Able to model, simulate, verify, analyze and synthesize with HDL.
- Able to design tests for digital logic circuits, and design for testability.

UNIT-I

OP-AMP AND ITS APPLICATIONS

Integrated circuits -types, classification, package types and temperature ranges, power supplies, OP-Amp Block diagram, ideal and practical OP-Amp specifications, DC and AC characteristics, 741 OP-Amp and its features, Inverting and non-inverting amplifier, integrator and differentiator, difference amplifier, instrumentation amplifier, AC amplifier, V-I, I-V converters, comparators, Multivibrators, Triangular and square wave generators, Log and antilog amplifiers, precision rectifiers.

UNIT-II

TIMERS AND PHASE LOCKED LOOPS: Introduction to 555 Timer, functional diagram, Monostable and Astable operations , Schmitt Trigger, PLL-Introduction, Block schematic, principles and description of individual blocks,565 PLL, applications.

UNIT–III

UNIPOLAR & BIPOLAR LOGIC FAMILIES: Introduction to logic families, CMOS logic, CMOS steady state electrical behavior, CMOS dynamic state electrical behavior, CMOS logic families, Bipolar logic, transistor logic, TTL families, CMOS/TTL interfacing, ECL, Comparison of logic families.

UNIT–IV

VHDL: Design flow, Program structure, data types and constants, functions and procedures, libraries and packages. Structural design elements, data design elements, behavioral design elements.

UNIT–V

COMBINATIONAL & SEQUENTIAL LOGIC: Decoders, encoders, multiplexers and demultiplexers code converters, comparators adders & Subtractor, Latches and flip-flops, shift registers ,counters .VHDL modes for the above ICs.

Text Books:

1. D. Roy Chowdhury, "Linear Integrated Circuits", New Age International (P) Ltd, 2nd Edition, 2003.

2. John F.Wakerly, "Digital Design Principles & Practices", PHI/Pearson Education 3rd, 2005

3. Charles H.Roth jr, "Digital System Design using VHDL", Cengage Publications, 1st edition.

References:

1. Ramakanth A. Gayakwad, "Op-Amps & Linear ICs", 4th edition, PHI, 1987.

2. James M.Fiore, "Operational Amplifiers & Linear integrated circuits & applications", Cengage 2009.

3. J.Bhaskar, "VHDL primer", Pearson Education/PHI,3rd Edition

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1514602	PJ	Microprocessors & Microcontrollers	3	1	0	30	70	3

Course Objectives:

- To become familiar with 8085 & 8086 Microprocessor Architecture, Instructions, Operating Modes, Programming.
- To use 8086 microprocessor for various applications.
- To study various peripherals for microprocessor based systems.

Learning Outcomes:

- This course describes the Architecture and instruction set of 8085 Microprocessors and.
- This course describes the Architecture and instruction set of 8086 Microprocessors
- Students get the ability to write programs and execute using 8086 Microprocessor.
- They know about data transfer schemes and Interface the 8086 Microprocessor to the outside world
- This course describes the Architecture and instruction set of 8051Microcontrollers
- Students get the ability to write programs and execute using 8051 Microcontroller.

UNIT I

INTRODUCTION: Development of microprocessors, Brief introduction to 8085,8086 microprocessor - Architecture, Instruction set, Addressing modes, Interrupt system. Minimum mode 8086 system and timings, Maximum mode 8086 system and timings.

UNIT II

ASSEMBLY LANGUAGE PROGRAMMING: Assembler directives, Assembly language programs (8086) with Assembler directives for addition, subtraction, multiplication, division etc., sorting and searching, bit manipulation, Programs using look-up tables, Delay subroutines. Stages of software development.

UNIT III

Data transfer schemes : Synchronous, Asynchronous, Interrupt driven and DMA type schemes, Programmable interrupt controller (8259) and its interfacing, Programmable DMA controller(8257) and its interfacing, Programmable Interval Timer (8253) and its interfacing, Programmable Communication Interface(8251 USART) and its interfacing.

UNIT IV

Memory interfacing to 8086 : Interfacing various types of RAM and ROM chips, 8255 PPI and its interfacing, ADC and DAC Interfacing, Data acquisition, Waveform generation, Traffic light controller, Stepper motor control, temperature measurement and control.

UNIT V

8051 Microcontroller : Architecture, Register set, Instruction set, Interrupt structure, timer and serial port operations, Memory and I/O interfacing, Simple Assembly language programs.

Text Books:

1. A.K. Ray and K.M. Bhurchandi, "Advanced Microprocessors and Peripherals", TMH.
2. Douglas V. Hall, "Microprocessors and interfacing: Programming and hardware", 2nd edition,
   Tata McGraw-Hill.
3. Kenneth J Ayala, "The 8051 Micro Controller Architecture, Programming and Applications",
   2nd Edition, Pernam International / Thomson Publishers, 2005.
4. Ajay V. Deshmukh, "Microcontrollers - theory applications", Tata McGraw-Hill.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502603	PJ	Power Semiconductor Drives	3	1	0	30	70	3

Objective:

This course is an extension of Power Electronics applications to AC and DC drives. Control of DC motor drives with single phase and three phase converters and choppers are given in detail. The control of AC motor drives with variable frequency converters and variable voltage are presented.

UNIT – I

Electrical Drives: Introduction – Electrical Drives, Advantages of Electrical Drives, Block Diagram of Electrical drives – status of dc and ac drives.

Dynamics of Electrical Drives: Fundamental Torque Equation, Speed-Torque Convention and multi quadrant operation, Loads with rotational motion, loads with translational motion, measurement of moment of inertia, components of load torques, Nature and classification of load torques.

UNIT – II

Control of Electrical DC-Drives –Modes of operation, speed control and drive classifications, closed loop control of drives.

D.C. Motor Drives speed control Armature voltage control, and Controlled rectifier fed DC drives 1-Φ and 3-Φ fully controlled and half controlled converter fed separately Excited D.C. Motor (discontinuous and continuous mode), chopper controlled DC drives (separately Excited motor)- Braking Methods.

UNIT – III

Induction Motor Drives – Speed control – stator voltage control – A.C. Voltage controllers, Variable frequency and variable voltage control from inverter- Rotor Side Control of Induction Motor, Elementary Concepts of Vector Control and direct torque control.

UNIT – IV

Synchronous Motor Drives – Torque Expression – open loop VSI fed drive – self control Brushless DC motor Drives – applications.

UNIT – V

Energy Conservation in Electrical Drives – Losses in Electrical Drive System, Measures of energy conservation in Electrical drives, use of efficient Converters, Energy Efficient operation of drives, improvement of P.F.- improvement of quality of supply-maintenance of motors.

COURSE OUTCOMES: On successful completion of course the student will be able to

1. demonstrate knowledge on
   - dynamics of electrical drives.
   - operation and speed control of various DC and AC drives in open loop.
   - closed loop control of converter fed motors.
   - Energy conservation in electrical drives
2. analyze single and multi-quadrant operations of DC and AC drives with speed - torque characteristics.

3. evaluate control parameters for speed control of electrical motors fed by power electronics modulators.
4. Design rectifier control of DC drives, Inverter control of AC drives.

TEXT BOOKS:

1. Fundamentals of Electrical Drives by G. K. Dubey, Narosa Publications
2. Power Electronic Circuits, Devices and Applications by M. H. Rashid, PHI

Reference Books:

1. Power Electronics by M.D. Singh and K. B. Khanchandani, TMH, 1998.
2. Modern Power Electronics and AC Drives by B. K. Bose, PHI.
3. Thyristor Control of Electric Drives by Vedam Subramanyam, TMH
4. Analysis of Thyristor Power Conditioned Motors by S. K. Pillai, Universities Press, 1st edition.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502604	PJ	Power Systems - III	3	1	0	30	70	3

Objective:

This course introduces formation of Y bus of a Power System, power flow studies by various methods. It deals with analysis of power system transients and also the analysis of power system for steady state and transient stability.

UNIT I

Load Flow Studies – I: Need for load flow studies in a power system – Formation of Bus admittance matrix – Classification of types of buses in a power system – Formulation of load flow equations – Gauss-Seidel iterative method for load flow studies – Treatment of PV bus – Acceleration factors – Problems(Sample One Iteration Only).

UNIT II

Load Flow Studies –II: Newton - Raphson Method in Rectangular and Polar Coordinates – Formulation of Load Flow Solution with or Without PV Buses – Derivation of Jacobian Elements, Algorithm and Flow Chart. Decoupled and Fast decoupled Methods – Representation of transformer in load flow studies.

UNIT III

Stability Studies - Classification of stability studies – The power flow equations of wound rotor and salient pole synchronous machine connected to infinite bus through a transmission system under steady state and transient state – Power flow equations of a two machine system with and without losses – Power flow equations in terms of ABCD constants – Power angle diagrams – Steady State Stability and Limits, Methods of Improvement of Steady State Stability.

UNIT IV

Transient Stability Analysis - General considerations and assumptions – Transient stability and stability limits – Inertia Constant, Derivation of Swing Equations, Equal area criterion – Application of equal area criterion to a) Sudden increase in input b) Sudden three phase fault on one of the lines of a transmission system – Determination of critical clearing angle – Clearing Time- – Limitations of equal area criterion. Solution of swing equation of one machine system by point by point method – Methods for improving power system stability.

UNIT V

Power System Transients – Types of System Transients – Travelling or Propagation of Surges – Attenuation, Distortion, Reflection and Refraction Coefficients – Termination of Lines with Different Types of Conditions – Open Circuited Line, Short Circuited Line, T – Junction, Lumped Reactive Junctions – Problems.

COURSE OUTCOMES: On successful completion of the course, student will be able

1. demonstrate knowledge on
    - the formation of network matrices.
    - load flow studies.
    - Transients on power system.
    - power system stability.

2. Analyze
    - the power flows and losses in the power system network using load flow analysis for different conditions.
    - the stability of the power system for different loading and faulted conditions.
3. demonstrate skills in evaluating
    - bus impedance and bus admittance matrices.
    - the load flow solution for a power system network for different conditions.
    - the various stability limits for various operating conditions.
4. apply the load flow and stability concepts to investigate various power system problems.

Text Books

1. Computer Methods in Power Systems by Stagg EI – Abiad & Stags, TMH
2. Modern Power System Analysis by I. J. Nagarath & D. P. Kothari, TMH, 2nd Edition.
3. Power System Analysis by Nagsarkar and Sukhija, OXFORD University Press.

Reference Books

1. Power System Analysis by Grainger and Stevenson, TMH.
2. Computer Techniques in Power System Analysis by M. A. Pai, TMH, 2nd Edition.
3. Computer Modeling of Electric Power Systems by J. Arrillaga and N. R. Watson, John Wiley Student Edition, 2nd Edition.
4. Computer Techniques and Models in Power Systems by K. Uma Rao, I. K. International.
5. Electric Power Systems by S. A. Nasar, Schaum's Outline Series, Revised 1st Edition, TMH.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502605	PJ	Power System Operation and Control	3	1	0	30	70	3

Objective: This subject deals with Economic operation of Power Systems, Hydrothermal Scheduling and Modeling of Turbines, Generators and Automatic Controllers. It Emphasizes on Single Area and Two Area Load Frequency Control and Reactive Power Control.

UNIT I

Economic Operation: Optimal Operation of Thermal Power Units, - Heat Rate Curve – Cost Curve – Incremental Fuel and Production Costs, Input-Output Characteristics, Optimum Generation Allocation with Line Losses Neglected. Optimum Generation Allocation including the Effect of Transmission Line Losses – Loss Coefficients, General Transmission Line Loss Formula.

UNIT II

Unit Commitment: Optimal Unit Commitment, Constraints in unit commitment, Unit commitment Solution methods: Priority-List methods, Dynamic Programming solution. Backward DP Approach, Forward DP Approach.

UNIT III

Hydrothermal Scheduling: Optimal Scheduling of Hydrothermal System: Hydroelectric Power Plant Models, Scheduling Problems- Short Term Hydrothermal Scheduling Problem.

Modeling of Turbine: First Order Turbine Model, Block Diagram Representation of Steam Turbines and Approximate Linear Models. Modeling of Governor: Mathematical Modeling of Speed Governing System – Derivation of Small Signal Transfer Function – Block Diagram.

UNIT IV

Load Frequency Control-I: Necessity of Keeping Frequency Constant. Definitions of Control Area – Single Area Control – Block Diagram Representation of an Isolated Power System – Steady State Analysis Dynamic Response – Uncontrolled Case.

UNIT V

Load Frequency Control-II:

Load Frequency Control of Two -Area System – Uncontrolled Case and Controlled Case, Tie-Line Bias Control. Proportional Plus Integral Control of Two Area and Its Block Diagram Representation, Steady State Response. Load Frequency Control and Economic Dispatch Control.

COURSE OUTCOMES: On successful completion of this course, a student will be able to

1. demonstrate knowledge on
    - characteristics of thermal and hydro units
    - optimal operation and unit commitment of thermal units.
    - scheduling of hydrothermal power plants.

- modeling of power system components for LFC studies.
- load frequency control of single area and two area systems.

2. analyze
   - the economic operation criteria for thermal and hydrothermal units with and without losses.
   - unit commitment of thermal units.
   - LFC parameters in single and two area power system.
   - Power Factor correction and Reactive Power Compensation

3. design suitable controllers to improve LFC dynamics in a single area and two area power system.

4. Acquire skills in
   - economic scheduling of thermal and hydrothermal units for optimal operation and minimizing fuel cost.
   - planning of generators operating schedule using unit commitment methods.
   - evaluating the steady state frequency deviations for a load disturbance in single and two area power system.

Text Books:

1. Power System Analysis Operation and Control by A. Chakravarthy and S. Halder, 3rd Edition, PHI, 2012.
2. Modern Power System Analysis by I. J. Nagrath & D. P. Kothari, Tata Mc Graw – Hill Publishing Company Ltd, 2nd Edition, 2003.
3. Power Systems Analysis and Stability by S.S.Vadhera, Khanna Publications.

Reference Books:

1. Power System Analysis and Design by J. Duncan Glover and M.S. Sharma., THOMSON, 3rd Edition, 2008.
2. Electric Power Systems by S. A. Nasar, Schaum Outline Series, Revised 1st Edition, TMH, 2005.
3. An Introduction to Reactive Power Control and Voltage Stability in Power Transmission Systems by Abhijit Chakrabarti, D. P. Kothari, A. K. Mukhopadhyay and Abhinandan De, Eastern Economy Edition, 2010
4. Restructured Electrical power systems by Mohammad Shahidehpour, Muwaffaq Alomoush, Maecel Dekker, Inc, New York. Basel

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1504606	PJ	Instrumentation (CBCC-II)	3	1	0	30	70	3

OBJECTIVES : The objectives of the course are to make the students learn about:

- Common errors that occur in measurement systems, and their classification
- Characteristics of signals, their representation, and signal modulation techniques
- Methods of Data transmission, telemetry, and Data acquisition.
- Working principles of different signal analyzers and Digital meters.
- Several types of transducers and their use for measurement of non-electrical quantities.

UNIT-I: CHARACTERISTICS OF SIGNALS AND THEIR REPRESENTATION

Measuring Systems, Performance Characteristics, - Static Characteristics, Dynamic Characteristics; Errors in Measurement – Gross Errors, Systematic Errors, Statistical Analysis of Random Errors. Signals and Their Representation: Standard Test, Periodic, Aperiodic, Modulated Signal, Sampled Data, Pulse Modulation and Pulse Code Modulation.

UNIT-II: DATA TRANSMISSION , TELEMETRY AND DAS

Methods of Data Transmission – General Telemetry System. Frequency Modulation (FM), Pulse Modulation (PM), Pulse Amplitude Modulation (PAM), Pulse Code Modulation (PCM) Telemetry. Comparison of FM, PM, PAM and PCM. Analog and Digital Data Acquisition Systems – Components of Analog DAS – Types of Multiplexing Systems: Time Division and Frequency Division Multiplexing – Digital DAS – Block Diagram — Modern Digital DAS (Block Diagram)

UNIT-III: SIGNAL ANALYZERS, DIGITAL METERS

Wave Analysers- Frequency Selective Analyzers, Heterodyne, Application of Wave Analyzers- Harmonic Analyzers, Total Harmonic Distortion, Spectrum Analyzers, Basic Spectrum Analyzers, Spectral Displays, Vector Impedance Meter, Q Meter. Peak Reading and RMS Voltmeters, Digital Voltmeters - Successive Approximation, Ramp and Integrating Type-Digital Frequency Meter-Digital Multimeter-Digital Tachometer

UNIT-IV: TRANSDUCERS

Definition of Transducers, Classification of Transducers, Advantages of Electrical Transducers, Characteristics and Choice of Transducers; Principle of Operation of Resistive, Inductive, Capacitive Transducers, LVDT, Strain Gauge and Its Principle of Operation, Gauge Factor, Thermistors, Thermocouples, Synchros, Piezoelectric Transducers, Photovoltaic, Photo Conductive Cells, Photo Diodes.

UNIT-V: MEASUREMENT OF NON-ELECTRICAL QUANTITIES

Measurement of strain, Gauge Sensitivity, Measurement of Displacement, Velocity, Angular Velocity, Acceleration, Force, Torque, Temperature, Pressure, Flow, Liquid level.

OUTCOMES: The student should be able to:

- Identify and explain the types of errors occuring in measurement systems
- Differentiate among the types of data transmission and modulation techniques
- Apply digital techniques to measure voltage, frequency and speed
- Choose suitable transducers for the measurement of non-electrical quantities

TEXT BOOKS:

1. A course in Electrical and Electronic Measurements and Instrumentation, A.K. Sawhney, Dhanpat Rai & Co., 2012.
2. Transducers and Instrumentation, D.V.S Murty, Prentice Hall of India, 2nd Edition, 2004.

REFERENCE BOOKS:

1. Modern Electronic Instrumentation and Measurement technique, A.D Helfrick and W.D.Cooper, Pearson/Prentice Hall of India., 1990.
2. Electronic Instrumentation, H.S.Kalsi Tata MCGraw-Hill Edition, 2010.
3. Industrial Instrumentation – Principles and Design, T. R. Padmanabhan, Springer, 3rd re print, 2009.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502607	PJ	Soft Computing Techniques	3	1	0	30	70	3

(CBCC-II)

Objective:

This course deals with various Artificial Intelligent Techniques, i.e., Artificial Neural Networks, Fuzzy Logic and its basic concepts. It also deals with role of ANN and Fuzzy Logic in various Electrical Engineering Applications.

UNIT I

Introduction to Artificial Intelligence: Introduction and motivation – Approaches to AI – Architectures of AI – Symbolic Reasoning System –Rule based Systems – Knowledge Representation.

UNIT II

Artificial Neural Networks: Basics of ANN - Comparison between Artificial and Biological Neural Networks – Basic Building Blocks of ANN – Artificial Neural Network Terminologies – McCulloch Pitts Neuron Model – Learning Rules – ADALINE and MADALINE Models – Perceptron Networks – Back Propagation Neural Networks – Associative Memories.

UNIT III

ANN Applications to Electrical Systems: ANN approach to: Electrical Load Forecasting Problem – Control Systems – Pattern Recognition.

UNIT IV

Fuzzy Logic: Classical Sets – Fuzzy Sets – Fuzzy Properties and Operations – Fuzzy Logic System – Fuzzification –Defuzzification – Membership Functions – Fuzzy Rule base – Fuzzy Logic Controller Design.

UNIT V

Fuzzy Logic Applications to Electrical Systems: Fuzzy Logic Implementation for Induction Motor Control – Power System Control – Automatic Generation Control – Switched Reluctance Motor Control – Modelling and Control of DC Drive – Automatic Voltage Regulator.

COURSE OUTCOMES: On successful completion of the course, student will be able to

1. demonstrate the knowledge on learning strategies of an artificial neural network, components of fuzzy logic system and operators of genetic algorithm.
2. design fuzzy systems, neural networks and genetic algorithm for real time problems.
3. exhibit problem solving skills in fuzzy set theory and learning methods of neural networks.
4. apply various configurations of neural networks, fuzzy systems and genetic algorithms to different engineering applications.

Text Books:

1. Introduction to Neural Networks using MATLAB by S. N. Sivanandam, S. Sumathi and S. N. Deepa, Tata McGraw Hill Edition, 2006.
2. Fuzzy Logic with Engineering Applications by Timothy J. Ross, WILEY India Edition, 3rd Edition, 2012.

Reference Books:

1. Introduction to Fuzzy Logic using MATLAB by S. N. Sivanandam, S. Sumathi and S. N. Deepa, Springer International Edition, 2013.
2. Intelligent System – Modeling, Optimization & Control by Yung C. Shin and Chengying Xu, CRC Press, 2009.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1513608	PJ	OptimizationTechniques	3	1	0	30	70	3

(CBCC-II)

Course Objective:

The main objective of the course is to enlighten the students with various optimization methods such as Linear Programming Technique, Constrained and Un-constrained Non-Linear Programming Technique and Transportation algorithm to understand and apply in industrial operations.

UNIT - I

Introduction to Classical Optimization Techniques: Statement of an optimization problem – design vector – design constraints – constraint surface – objective function – objective function surfaces – classification of optimization problems.

Single variable optimization – multi variable optimization without constraints – necessary and sufficient conditions for minimum/maximum – multivariable optimization with equality constraints, solution by method of Lagrange Multipliers – multivariable optimization with inequality constraints – Kuhn Tucker conditions.

UNIT - II

Linear Programming: Standard form of a linear programming problem – geometry of linear programming problems – definitions and theorems – solution of a system of linear simultaneous equations – pivotal reduction of a general system of equations – motivation to the simplex method – simplex algorithm.

UNIT - III

Transportation Problem: Finding initial basic feasible solution by north-west corner rule, least cost method and Vogel's approximation method – testing for optimality of balanced transportation problems.

UNIT – IV

Unconstrained Non-Linear Programming: One-dimensional minimization methods: Classification, Fibonacci method and Quadratic interpolation method. Univariate method, Powell's method and steepest descent method.

UNIT - V

Constrained Non-linear Programming: Characteristics of a constrained problem, Classification, Basic approach of penalty function method, Basic approaches of interior and exterior penalty function methods, Introduction to convex programming problem.

Text Books:

1. Engineering Optimization: Theory and Practice by S. S. Rao, New Age International (P) Ltd., 3rd edition, 1998.
2. Introductory Operations Research by H. S. Kasene & K. D. Kumar, Springer (India) Pvt. Ltd.
3. Operation Research by K. Rajagopal, PHI Publications.

Reference Books:

1. Optimization Methods in Operation Research and System Analysis by K. V. Mittal and C. Mohan, New Age International (P) Ltd., 3rd edition, 1996.
2. Operation Research by Dr. S. D. Sharma, Kedernath Ramnath and Company, 11th edition, Reprint 1997.
3. Operation Research: An Introduction by H. A. Taha, PHI Pvt. Ltd., 6th edition.
   Linear Programming by G. Hadley, Narosa Publishing House, 2002.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1524609	PJ	Advanced English Communication Skills Lab	0	0	3	50	0	0

AUDIT COURSE

Introduction

The Advanced English Language Skills Lab introduced at the 3rd year B.Tech level is considered essential for the student for focusing on his/her career. At this stage it is imperative for the student to start preparing for the ever growing competition in the job market. In this scenario, in order to be on par with the best, he/she needs to improve his/her Communication and soft skills

This course focuses on the practical aspects of English incorporating all the four (LRSW) skills relevant to the requirements of the prospective employers in view of globalization. The proposed course will enable the students to perform the following:

- Intensive reading to improve comprehension and communication
- Attentive listening for better understanding
- Write project/research/technical reports
- Write Resume' to attract attention
- Discuss ideas / opinions for better solutions
- Face interviews confidently
- Gather information, organize ideas, and present them effectively before an audience
- To help the students cultivate the habit of reading passages from the computer monitor, thus providing them with the required ability to face computer-based competitive exams such GRE, TOEFL, CAT, GMAT etc.

Objectives:

Keeping in mind the previous exposure of the student to English, this lab focuses on improving the student's proficiency in English at all levels. The lab intends t**o** train students to use language effectively, to participate in group discussions, to help them face interviews, and sharpen public speaking skills and enhance the confidence of the student by exposing him/her to various situations and contexts which he/she would face in his/her career.

Syllabus

The following course content is prescribed for the Advanced Communication Skills Lab:

Reading Comprehension -- Reading for facts, guessing meanings from context, speed reading, scanning, skimming for building vocabulary(synonyms and antonyms, one word

substitutes, prefixes and suffixes, idioms and phrases.)

Listening Comprehension-- Listening for understanding, so as to respond relevantly and appropriately to people of different backgrounds and dialects in various personal and professional situations.

Technical Report Writing—Types of formats and styles, subject matter, organization, clarity, coherence and style, data-collection, tools, analysis

Resume' Writing—Structure, format and style, planning, defining the career objective, projecting one's strengths, and skills, creative self marketing, cover letter

Group Discussion-- Communicating views and opinions, discussing, intervening. Providing solutions on any given topic across a cross-section of individuals,(keeping an eye on modulation of voice, clarity, body language, relevance, fluency and coherence) in personal and professional lives.

Interview Skills—Concept and process, pre-interview planning, mannerisms, body language, organizing, answering strategies, interview through tele and video-conferencing

Technical Presentations (Oral)— Collection of data, planning, preparation, type, style and format ,use of props, attracting audience, voice modulation, clarity, body language, asking queries.

Minimum Requirements: The English Language Lab shall have two parts:

The Computer aided Language Lab for 60 students with 60 systems, one master console, LAN facility and English language software for self-study by learners.

The Communication Skills Lab with movable chairs and audio-visual aids with a P. A System, a TV, A digital stereo-audio and video system, Camcorder etc

System Requirement (Hardware Component):

Computer network with LAN with a minimum of 60 multimedia systems with the following specifications:

P-IV Processor, Speed-2.8 GHz, RAM_512 MB minimum, Hard Disk-80 GB, Headphones

Prescribed Software: Walden and K-van Solutions.

Books Suggested for English Language Lab Library (to be located within the lab in addition to the CDs of the text book which are loaded on the systems):

1. **Technical writing and professional communication, Huckin and Olsen** Tata Mc Graw-Hil 2009.
2. **Speaking about Science**, A Manual for Creating Clear Presentations **by Scott Morgan and Barrett Whitener, Cambridge University press, 2006**
3. **Books on** TOEFL/GRE/GMAT/CAT/ IELTS **by Barron's/DELTA/Cambridge University Press.**
4. **Handbook for Technical Writing** by David A Mc Murrey & Joanne Buckely CENGAGE Learning 2008
5. **Technical Communication** by Meenakshi Raman & Sangeeta Sharma, Oxford University Press 2009.
6. **The ACE of Soft Skills** by Gopal Ramesh and Mahadevan Ramesh, Pearson Education, 2010
7. **Cambridge English for Job-Hunting** by Colm Downes, Cambridge University Press, 2008
8. **Resume's and Interviews** by M.Ashraf Rizvi, Tata Mc Graw-Hill, 2008.
9. **From Campus To Corporate** by KK Ramachandran and KK Karthick, Macmillan Publishers India Ltd, 2010
10. **English Language Communication: A Reader cum Lab Manual** Dr A Ramakrishna Rao, Dr.G Natanam & Prof SA Sankaranarayanan, Anuradha Publications, Chennai 2008.
11. **Managing Soft Skills** by K R Lakshminarayan and T.Muruguvel, Sci-Tech Publications, 2010

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502610	PJ	Power Electronics and Simulation Lab	0	0	3	50	50	2

Any eight of the experiments in Power Electronics Lab

1. Study of characteristics of SCR, MOSFET & IGBT
2. Gate firing circuits for SCR's
3. Single Phase AC Voltage Controller with R and RL Loads
4. Single Phase fully controlled bridge converter with R and RL loads
5. Forced Commutation circuits (Class A, Class B, Class C, and Class D & Class E)
6. DC Jones chopper with R and RL Loads
7. Single Phase Parallel, inverter with R and RL loads
8. Single Phase Cyclo converter with R and RL loads
9. Single Phase Half controlled converter with R load
10. Three Phase Half controlled bridge converter with R-load
11. Single Phase series inverter with R and RL loads
12. Single Phase Bridge converter with R and RL loads
13. Single Phase Dual converter with RL loads

Any two simulation experiments with PSPICE/PSIM

1. PSPICE simulation of single-phase full converter using RLE loads and single-phase AC voltage controller using RLE Loads
2. PSPICE simulation of resonant pulse commutation circuit and BUCK chopper
3. PSPICE simulation of single phase inverter with PWM control

COURSE OUTCOMES: On successful completion of this course, the students will be able to

1. demonstrate knowledge on
   - power electronic devices such as SCR, MOSFET, IGBT.
   - Static V-I characteristics of power electronic devices
   - Conversion techniques such as AC-DC, AC-AC,DC-AC and DC-DC.
2. Analyze the performance parameters of different types of bridge converters.
3. Evaluate the performance parameters of half controlled, fully controlled rectifiers, AC voltage controllers and cyclo converters.
4. function effectively as individual and as member in a team.
5. communicate effectively both oral and written.

REFERENCE BOOKS:

1. Simulation of Electric and Electronic Circuits using PSPICE – by M. H. Rashid, PHI.
2. PSPICE A/D user's manual – Microsim, USA
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Book's user's manual and –Mathworks, USA.

Subject Code	Subject Category	Subject Title	L	T	P	IM	EM	CR
1502611	PJ	Control Systems and Simulation Lab	0	0	3	50	50	2

Any Eight of the following experiments are to be conducted

1. Time response of Second order system
2. Characteristics of Synchros
3. Programmable logic controller – Study and verification of truth tables of logic gates, simple Boolean expressions and application of speed control of motor.
4. Effect of feedback on DC servo motor
5. Transfer function of DC Machine
6. Effect of P, PD, PI, PID Controller on a second order systems
7. Microprocessor based stepper motor controller
8. Temperature controller using PID
9. Characteristics of magnetic amplifiers
10. Characteristics of AC servo motor
11. Water Level Controller.

Any two simulation experiments are to be conducted

1. Lag and lead compensator design in frequency domain using MATLAB.
2. Linear system analysis (Time domain analysis, Error analysis) using MATLAB.
3. Stability analysis (Bode, Root Locus, Nyquist) of Linear Time Invariant system using MATLAB
4. State space model for classical transfer function using MATLAB – Verification.

COURSE OUTCOMES: On successful completion of the course, student will be able to

1. demonstrate knowledge on
   - performance of controllers on second order system
   - Performance of Synchros, armature controlled DC motor
2. analyze the characteristics of magnetic amplifier, Servomotor
3. design the bode plot, root locus, lag-lead compensation and state space model in MATLAB
4. Evaluate stability of linear systems
5. function effectively as an individual and as member in a team.
6. communicate effectively both oral and written.

REFERENCE BOOKS:

1. Simulation of Electrical and electronics Circuits using PSPICE – by M.H. Rashid, M/s PHI Publications.
2. PSPICE A/D user's manual – Microsim, USA.
3. PSPICE reference guide – Microsim, USA.
4. MATLAB and its Tool Books user's manual and – Mathworks, USA.