

B.Tech. III - II Sem.

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**(13A52601) MANAGEMENT SCIENCE**

**Course Objective:**

*The objectives of this course are to equip the student the fundamental knowledge of Management Science and its application to effective management of human resources, materials and operations of an organization. It also aims to expose the students about the latest and contemporary developments in the field of management.*

**Learning outcome:**

*This course enables the student to know the principles and applications of management knowledge and exposure to the latest developments in the field. This helps to take effective and efficient managerial decisions on physical and human resources of an organization. Besides, the knowledge of Management Science facilitates for his/her personal and professional development.*

**UNIT I**

**INTRODUCTION TO MANAGEMENT**

Definition of Management- Function of Management- Management as a Science and Art-Management as a Profession- Universality of Management- Henri Faylo's Administrative Theory –Elton Mayo's Human Relations Movement- Systems theory – Contingency theory- Monetary and non-monetary incentives to motivate work teams- Leadership –Definition- Qualities of successful leaders- Different leadership styles.

**UNIT II**

**ORGANIZATION DESIGN AND STRUCTURE**

Organization design and structure- Principles—Types of organization structure-Mechanic and Organic Structures- Line organization- Line & Staff organization- Functional Organization – Matrix organization structures- merits and demerits- Departmentation and Decentralization-Power and Authority- Delegation of authority-Principles for effective delegation of authority.

**UNIT III**

**HUMAN RESOURCE AND MATERIALS MANAGEMENT**

Concept of HRM-functions – Human Resource Planning-Job Analysis-Recruitment and Selection- Training and Development- Performance appraisal –methods- Wage and Salary Administration- Grievances handling Procedure-Material Management- Need for Inventory control- Economic order quantity- ABC analysis- Management of purchase, stores and stores records.-Marketing Management – Concept- Channels of distribution- Marketing mix and product mix.

**UNIT IV**

**MANAGEMENT OF OPERATIONS & PROJECT MANAGEMENT**

Nature of organizational control- Marketing control- HR control- effective control systems- Operations Management- Essentials of operations management- Trends in operational management- Designing operation system for effective management of an organization-Project Management –Network Analysis- PERT and CPM-Project crashing (Simple problems)

**UNIT V**

**CONTEMPORARY MANAGEMENT ISSUES**

Strategic Management-Concept- Mission-Vision-Core values-Setting objectives-Corporate planning – Environmental scanning-SWOT analysis- Steps in strategy formulation & implementation- Management

Information System (MIS)- Enterprise Resource Planning (ERP)-Just-in-Time (JIT)- Total Quality Management (TQM) – Supply Chain Management-Six Sigma-Business Process Outsourcing (BPO).

**Text Books:**

1. Stoner, Freeman, Gilbert, *Management*, Pearson, Six Edition 2008
2. Aryasri: *Management Science*, Fourth Edition TMH, 2012.

**Reference Books:**

1. Vijay Kumar & Apparo, *Introduction to Management Science*, Cengage, 2011.
2. Kotler Philip & Keller Kevin Lane: *Marketing Management*, 14<sup>th</sup> Edition, Pearson, 2012.
3. Aswathappa, *Human Resource Management*, Himalaya, 2012.
4. Kanishka Bedi, *Production and Operations Management*, Oxford University Press, 2011.
5. Schermerhorn, Capling, Poole & Wiesner: *Management*, Wiley, 2012.
6. Joseph M Putti, *Management Principles*, Mc Millan Publishers, 2012.

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**(13A02601) POWER SEMICONDUCTOR DRIVES**

**Course 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**

**CONVERTER FED DC MOTORS**

Introduction to Thyristor Controlled Drives, Single Phase, Three Phase Semi and Fully Controlled Converters Connected to D.C Separately Excited and D.C Series Motors – Continuous Current Operation – Output Voltage and Current Waveforms – Speed and Torque Expressions – Speed – Torque Characteristics- Problems.

**UNIT II**

**FOUR QUADRANT OPERATION OF DC DRIVES**

Introduction to Four Quadrant Operation – Motoring Operations, Electric Braking – Plugging, Dynamic and Regenerative Braking Operations. Four Quadrant Operation of D.C Motors by Dual Converters – Closed Loop Operation of DC Motor (Block Diagram Only)

**UNIT III**

**CHOPPER FED DC MOTORS**

Single Quadrant, Two –Quadrant and Four Quadrant Chopper Fed DC Separately Excited and Series Excited Motors – Continuous Current Operation – Output Voltage and Current Wave Forms – Speed Torque Expressions – Speed Torque Characteristics – Problems on Chopper Fed D.C Motors – Closed Loop Operation ( Block Diagram Only)

**UNIT IV**

**CONTROL OF INDUCTION MOTOR**

Induction Motor Stator Voltage Control and Characteristics by AC Voltage Controllers – Waveforms – Speed Torque Characteristics - Stator Frequency Control and Characteristics by Voltage Source and Current Source Inverter and Cycloconverters- PWM Control – Comparison of VSI and CSI Operations – Speed Torque Characteristics – Numerical Problems on Induction Motor Drives – Closed Loop Operation of Induction Motor Drives (Block Diagram Only)

Static Rotor Resistance Control – Slip Power Recovery – Static Scherbius Drive – Static Kramer Drive – Their Performance and Speed Torque Characteristics – Advantages- Applications – Problems

**UNIT V**

**CONTROL OF SYNCHRONOUS MOTORS**

Separate Control & Self Control of Synchronous Motors – Operation of Self Controlled Synchronous Motors by VSI and CSI Cycloconverters. Load Commutated CSI Fed Synchronous Motor – Operation – Waveforms – Speed Torque Characteristics – Applications – Advantages and Numerical Problems – Closed Loop Control Operation of Synchronous Motor Drives (Block Diagram Only), Variable Frequency Control, Cycloconverter, PWM, VFI, CSI.

**Text Books:**

1. Power semiconductor controlled drives by G K Dubey, Prentice Hall, 1989.
2. Power Electronic Circuits, Devices and applications by M.H.Rashid, PHI, 2005.

**Reference Books:**

1. *Power Electronics* – MD Singh and K B Khanchandani, Tata – McGraw-Hill Publishing company, 1998
2. *Modern Power Electronics and AC Drives* by B.K.Bose, PHI, 1986.
3. *Thyristor Control of Electric drives* – Vedam Subramanyam Tata McGraw Hill Publications, 1988.
4. *A First course on Electrical Drives* – S K Pillai New Age International(P) Ltd. 2<sup>nd</sup> Edition, 1989.
5. *Electric Drives* by N. K. De, PHI Publications, 2006.

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**(13A02602) POWER SYSTEM PROTECTION**

**Course Objective:**

*This course introduces all varieties of Circuit Breakers and Relays for protection of Generators, Transformers and feeder bus bars from over voltages and other hazards. It emphasis on Neutral grounding for overall protection.*

**UNIT I**

**RELAYS**

Electromagnetic Relays - Basic Requirements of Relays – Primary and Backup Protection - Construction Details of – Attracted Armature, Balanced Beam, Inductor Type and Differential Relays – Universal Torque Equation – Characteristics of Over Current, Direction and Distance Relays. Static Relays – Advantages and Disadvantages – Definite Time, Inverse and IDMT Static Relays – Comparators – Amplitude and Phase Comparators. Microprocessor Based Relays – Advantages and Disadvantages – Block Diagram for Over Current (Definite, Inverse and IDMT) and Distance Relays and Their Flow Charts.

**UNIT II**

**PROTECTION OF GENERATORS & TRANSFORMERS**

Protection of Generators Against Stator Faults, Rotor Faults, and Abnormal Conditions. Restricted Earth Fault and Inter-Turn Fault Protection. Numerical Problems On percentage Winding Unprotected. Protection of Transformers: Percentage Differential Protection, Numerical Problem on Design of CT's Ratio, Buchholz Relay Protection, Numerical Problems.

**UNIT III**

**PROTECTION OF FEEDERS & LINES**

Protection of Feeder (Radial & Ring Main) Using Over Current Relays. Protection of Transmission Line – 3 Zone Protection Using Distance Relays. Carrier Current Protection. Protection of Bus Bars.

**UNIT IV**

**CIRCUIT BREAKERS**

Circuit Breakers: Elementary Principles of Arc Interruption, Recovery, Restriking Voltage and Recovery Voltages.- Restriking Phenomenon, Average and Max. RRRV, Numerical Problems - Current Chopping and Resistance Switching - CB Ratings and Specifications: Types and Numerical Problems. – Auto Reclosures. Description and Operation of Following Types of Circuit Breakers: Minimum Oil Circuit Breakers, Air Blast Circuit Breakers, Vacuum and SF6 Circuit Breakers.

**UNIT V**

**OVER VOLTAGES IN POWER SYSTEMS**

Generation of Over Voltages in Power Systems.-Protection Against Lightning Over Voltages - Valve Type and Zinc-Oxide Lightning Arresters - Insulation Coordination –BIL.

**Text Books:**

1. *Power System Protection and Switchgear* by Badri Ram, D.N Viswakarma, TMH Publications, 2011.
2. *Switchgear and Protection* – by Sunil S Rao, Khanna Publishers, 1992.
3. *Electrical Power Systems* – by C.L.Wadhwa, New Age international (P) Limited, Publishers, 2012.

**Reference Books:**

1. *Transmission network Protection* by Y.G. Paithankar ,Taylor and Francis,2009.
2. *Power system protection and switch gear* by Bhuvanesh Oza, TMH, 2010.
3. *Electrical power System Protection* by C. Christopoulos and A. Wright, 2<sup>nd</sup> Edition, Springer International Edition, 1999.

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**(13A04601) MICROPROCESSORS AND MICROCONTROLLERS**

**Course Objective:**

- To understand the architecture of 8086 MICROPROCESSOR.
- To learn various 8086 Instruction set and Assembler Directives.
- To become skilled in 8086 Assembly Language programming.
- To understand programmable peripheral devices and their Interfacing.
- To understand and learn 8051 microcontroller.
- To learn 8051 Assembly Language programming

**Learning Outcome:**

- Becomes skilled in various 8086 Instruction set and Assembler Directives
- Able to write 8086 Assembly Language programs.
- Able to understand programmable peripheral devices and their Interfacing.
- Able to write 8051 assembly Language programs.

**UNIT I**

**8085 ARCHITECTURE**

Introduction-8085 Architecture-Block Diagram, Flag Register, Pin Diagram, Timing and Control Signals, System Timing Diagram, Instruction Set of 8085- Instruction & Data Formats- Addressing Modes- Instructions.

**UNIT II**

**8086 ARCHITECTURE**

8086 Overview-Internal Architecture- Register Organization, Memory Segmentation, Flag Register, Pin Configuration, Physical Memory Organization, General Bus Operation- Minimum and Maximum Mode Signals, Timing Diagrams - Interrupts Of 8086.

**UNIT III**

**INSTRUCTION SET AND ASSEMBLY LANGUAGE PROGRAMMING OF 8086**

Instruction Formats -Addressing Modes-Instruction Set, Assembler Directives-Macros, Programs Involving Logical, Branch Instructions – Sorting and Evaluating Arithmetic Expressions - String Manipulations-Simple ALPs.

**UNIT IV**

**INTERFACING DEVICES**

8255 PPI- Block Diagram, Various Modes of Operation-Programmable Interval Timer 8254- Architecture, Operating Modes – Key Board/Display Controller 8279- Architecture, Modes of Operation, Command Words and Key Code and Status Data Formats-Programmable Communication Interface 8251 USART-Architecture, Description Of Operating Modes-DMA Controller 8257- Internal Architecture and Signal Description .

## **UNIT V**

### **INTRODUCTION TO MICRO CONTROLLERS 8051**

Introduction, Architecture, Registers, Pin Description, Connections, I/O Ports, Memory Organization, Addressing Modes, Instruction Set, Architectural features of Intels 16 bit Micro Controller.

#### **Text Books:**

1. *A.K.Ray and Bhurchandi, “Advanced Microprocessors and Peripherals”, 2<sup>nd</sup> Edition, TMH Publications.*
2. *Ajay V. Deshmukh, “Microcontrollers, Theory and applications”, Tata McGraw-Hill Companies – 2005*

#### **Reference Books:**

1. *Douglas V.Hall, “Microprocessors and Interfacing”, 2<sup>nd</sup> Revised Edition, TMH Publications.*
2. *Liu & Gibson, “Microcomputer Systems: The 8086/8088 Family: Architecture, Programming and Design”, 2<sup>nd</sup> ed., PHI*
3. *Kenneth j.Ayala, Thomson, “The 8051 Microcontrollers”, Asia Pte.Ltd*
4. *Krishna Kant, “Microprocessors and Microcontrollers”, PHI Publishers*



**(13A02603) POWER SYSTEM OPERATION AND CONTROL**

**Course 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**

**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 III**

**LOAD FREQUENCY CONTROL**

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. Load Frequency Control of 2-Area System – Uncontrolled Case and Controlled Case, Tie-Line Bias Control. Proportional Plus Integral Control of Single Area and Its Block Diagram Representation, Steady State Response – Load Frequency Control and Economic Dispatch Control.

**UNIT IV**

**REACTIVE POWER CONTROL**

Overview of Reactive Power Control – Reactive Power Compensation in Transmission Systems – Advantages and Disadvantages of Different Types of Compensating Equipment for Transmission Systems; Load Compensation – Specifications of Load Compensator, Uncompensated and Compensated Transmission Lines: Shunt and Series Compensation.

**UNIT V**

**POWER SYSTEM OPERATION IN COMPETITIVE ENVIRONMENT**

Introduction – Restructuring models – Independent System Operator (ISO) – Power Exchange - Market operations – Market Power – Standard cost – Transmission Pricing – Congestion Pricing – Management of Inter zonal/Intra zonal Congestion - Electricity Price Volatility Electricity Price Indexes – Challenges to Electricity Pricing – Construction of Forward Price Curves – Short-time Price Forecasting

**Text Books:**

1. *Power System Analysis Operation and Control* – A. Chakravorthy and S. Halder, 3<sup>rd</sup> Edition, PHI, 2012.

2. *Modern Power System Analysis* – by I.J.Nagrath & D.P.Kothari Tata McGraw – Hill Publishing Company Ltd, 2<sup>nd</sup> edition, 2003.
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.

**Reference Books:**

1. *Power System Analysis and Design* by J.Duncan Glover and M.S.Sharma., THOMSON, 3<sup>rd</sup> Edition, 2008.
2. *Electric Power Systems* by S. A. Nasar, Schaum's Outline Series, Revised 1<sup>st</sup> Edition, TMH, 2005.

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**(13A02604) POWER SYSTEM ANALYSIS**

**Course Objective:**

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

**UNIT I**

**POWER SYSTEM NETWORK MATRICES**

Representation of Power System Elements, Essential Characteristics of a Good Algorithm, Steps Involved in Solving a Problem Using Digital Computer - Graph Theory: Definitions, Bus Incidence Matrix,  $Y_{bus}$  Formation by Direct and Singular Transformation Methods, Numerical Problems. Formation of  $Z_{bus}$ : Partial Network, Algorithm for the Modification of  $Z_{bus}$  Matrix for Addition Element for the Following Cases: Addition of Element from a New Bus to Reference, Addition of Element from a New Bus to an Old Bus, Addition of Element Between an Old Bus to Reference and Addition of Element Between Two Old Busses (Derivations and Numerical Problems).- Modification of  $Z_{bus}$  for the Changes in Network ( Problems )

**UNIT II**

**POWER FLOW STUDIES-I**

Necessity of Power Flow Studies – Data for Power Flow Studies – Derivation of Static Load Flow Equations – Load Flow Solutions using Gauss Seidel Method: Acceleration Factor, Load Flow Solution with and without P-V Buses, Algorithm and Flowchart. Numerical Load flow Solution for Simple Power Systems (Max. 3-Buses); Determination of Bus Voltages, Injected Active and Reactive Powers (Sample One Iteration only) and Finding Line Flows/Losses for the given Bus Voltages.

**UNIT III**

**POWER FLOW STUDIES-II**

Newton Raphson Method in Rectangular and Polar Co-Ordinates Form: Load Flow Solution with or without PV Busses- Derivation of Jacobian Elements, Algorithm and Flowchart. Decoupled and Fast Decoupled Methods.- Comparison of Different Methods – DC Load Flow

**UNIT IV**

**SHORT CIRCUIT ANALYSIS**

Per-Unit System of Representation. Per-Unit Equivalent Reactance Network of a Three Phase Power System, Numerical Problems. Symmetrical Fault Analysis: Short Circuit Current and MVA Calculations, Fault Levels, Application of Series Reactors, Numerical Problems. Symmetrical Component Theory: Symmetrical Component Transformation, Positive, Negative and Zero Sequence Components: Voltages, Currents and Impedances. Sequence Networks: Positive, Negative and Zero sequence Networks, Numerical Problems. Unsymmetrical Fault Analysis: LG, LL, LLG faults with and without Fault Impedance, Numerical Problems.

**UNIT V**

**POWER SYSTEM STABILITY ANALYSIS**

Elementary Concepts of Steady State, Dynamic and Transient Stabilities. Description of: Steady State Stability Power Limit, Transfer Reactance, Synchronizing Power Coefficient, Power Angle Curve and Determination of Steady State Stability and Methods to Improve Steady State Stability. Derivation of Swing Equation. Determination of Transient Stability by Equal Area Criterion, Application of Equal Area

Criterion, Critical Clearing Angle Calculation. Solution of Swing Equation by 4<sup>th</sup> Order Runge – Kutta Method (up to 2 iterations) - Methods to improve Stability - Application of Auto Reclosing and Fast Operating Circuit Breakers.

**Text Books:**

1. *Power Systems Analysis*, by Grainger and Stevenson, Tata Mc Graw-hill Edition, 2005.
2. *Modern Power system Analysis* – by I.J.Nagrath & D.P.Kothari: Tata McGraw-Hill Publishing Company, 2<sup>nd</sup> edition, 2003.

**Reference Books:**

1. *Computer Techniques in Power System Analysis* by M A Pai, Second Edition, TMH, 2005.
2. *Computer Techniques and Models in Power Systems* by K. Uma Rao, I. K. International, 2007.
3. *Electric Power Systems* by S. A. Nasar, Schaum's Outline Series, Revised 1<sup>st</sup> Edition, TMH, 1997.

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**(13A02605) POWER SYSTEMS AND SIMULATION LAB**

1. Determination of Sequence Impedances of Cylindrical Rotor Synchronous Machine.
2. Fault Analysis – I  
LG Fault  
LL Fault
3. Fault Analysis – II  
LLG Fault  
LLLG Fault
4. Characteristics of Over Current Relay
5. Characteristics of Percentage Biased Differential Relay.
6. Gauss-Seidel load flow analysis using MATLAB
7. Newton Raphson method using MATLAB minimum of 6 bus system
8. Fast decoupled load flow analysis using MATLAB
9. Develop a Simulink model for a single area load frequency problem and Simulate the same.
10. Develop a PID controller for two-area power system and simulate the same.
11. Analysis of short circuit studies by using MiPower

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**(13A02606) ELECTRICAL MEASUREMENTS LAB**

**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 Coil Using 3 Voltmeter and 3 Ammeter Methods.

**In addition to the above eight experiments, atleast 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 Watt Meter Method (Balanced & Un balanced).
12. Dielectric Oil Testing Using H.T. Testing Kit
13. LVDT and Capacitance Pickup – Characteristics and Calibration
14. Resistance Strain Gauge – Strain Measurements and Calibration
15. Transformer Turns Ratio Measurement Using A.C. Bridge.
16. A.C. Potentiometer – Calibration of AC Voltmeter, Parameters of Choke

**B.Tech. III - II Sem.**

**(13A52502) ADVANCED ENGLISH LANGUAGE COMMUNICATION SKILLS LAB  
(Audit Course)**

**Introduction:**

*The introduction of the Advanced Communication Skills Lab is considered essential at 3<sup>rd</sup> year level. At this stage, the students need to prepare themselves for their careers which may require them to listen to, read, speak and write in English both for their professional and interpersonal communication in the globalised context.*

*The proposed course should be a laboratory course to enable students to use 'good' English and perform the following:*

- *Gathering ideas and information to organise ideas relevantly and coherently.*
- *Engaging in debates.*
- *Participating in group discussions.*
- *Facing interviews.*
- *Writing project/research reports/technical reports.*
- *Making oral presentations.*
- *Writing formal letters.*
- *Transferring information from non-verbal to verbal texts and vice-versa.*
- *Taking part in social and professional communication.*

**Course Objective:**

*This Lab focuses on using multi-media instruction for language development to meet the following targets:*

- *To improve the students' fluency in English, through a well-developed vocabulary and enable them to listen to English spoken at normal conversational speed by educated English speakers and respond appropriately in different socio-cultural and professional contexts.*
- *Further, they would be required to communicate their ideas relevantly and coherently in writing.*
- *To prepare all the students for their placements.*

**Learning Outcome:**

- *Accomplishment of sound vocabulary and its proper use contextually*
- *Flair in Writing and felicity in written expression.*
- *Enhanced job prospects.*
- *Effective Speaking Abilities*

The following course content to conduct the activities is prescribed for the Advanced English Language Communication Skills (AELCS) Lab:

**UNIT I**

**COMMUNICATIVE COMPETENCY**

1. Reading Comprehension
2. Listening comprehension
3. Vocabulary for competitive purpose
4. Spotting errors

**UNIT II**

**TECHNICAL WRITING**

1. Report writing
2. Curriculum vitae
3. Covering letter
4. E-mail writing

### UNIT III

#### PRESENTATIONAL SKILLS

1. Oral presentation
2. Power point presentation
3. Poster presentation
4. Stage dynamics

### UNIT IV

#### CORPORATE SKILLS

1. Dress code
2. Telephonic skills
3. Net Etiquettes

### UNIT V

#### GETTING READY FOR JOB

1. Group discussions
2. Interview skills
3. Psychometric tests

#### **Minimum Requirement:**

*The Advanced English Language Communication Skills (AELCS) Laboratory shall have the following infra-structural facilities to accommodate at least 60 students in the lab:*

- Spacious room with appropriate acoustics.
- Round Tables with movable chairs
- Audio-visual aids
- LCD Projector
- Public Address system
- P – IV Processor, Hard Disk – 80 GB, RAM–512 MB Minimum, Speed – 2.8 GHZ
- T. V, a digital stereo & Camcorder
- Headphones of High quality

#### **Suggested Software:**

*The software consisting of the prescribed topics elaborated above should be procured and used.*

*K-VAN SOLUTIONS-Advanced communication lab*

1. *DELTA's key to the Next Generation TOEFL Test: Advanced Skill Practice.*
2. *TOEFL & GRE( KAPLAN, AARCO & BARRONS, USA, Cracking GRE by CLIFFS)*
3. *Train2success.com*

#### **References:**

1. *Objective English For Competitive Exams, Hari Mohana Prasad, 4<sup>th</sup> edition, Tata Mc Graw Hill.*
2. *Technical Communication by Meenakshi Raman & Sangeeta Sharma, O U Press 2009.*
3. *Books on TOEFL/GRE/GMAT/CAT/ IELTS by Barron's/DELTA/Cambridge University Press.2012.*
4. *Soft Skills for Everyone, Butterfield Jeff, Cengage Publications, 2011.*
5. *Practice Psychometric Tests: How to familiarize yourself with genuine recruitment tests, 2012.*
6. *Management Shapers Series by Universities Press (India) Pvt Ltd., Himayatnagar, Hyderabad 2008.*
7. *Handbook for Technical Writing by David A McMurrey & Joanne Buckely CENGAGE Learning 2008.*
8. *English for Technical Communication for Engineering Students, Aysha Vishwamohan, Tata Mc Graw-Hill 2009.*
9. *Word Power Made Handy, Shalini Verma, S Chand Publications, 2011.*
10. *Effective Technical Communication, Ashrif Rizvi, TataMcGrahill, 2011.*