

ANNA UNIVERSITY, CHENNAI  
 AFFILIATED INSTITUTIONS  
 R-2013  
 B.E. BIOMEDICAL ENGINEERING  
**SEMESTER V**

| SL. NO.          | COURSE CODE | COURSE TITLE                                     | L         | T        | P         | C         |
|------------------|-------------|--|-----------|----------|-----------|-----------|
| <b>THEORY</b>    |             |  |           |          |           |           |
| 1.               | BM6501      | Bio Control Systems                              | 3         | 1        | 0         | 4         |
| 2.               | BM6502      | Diagnostic and Therapeutic Equipment - I         | 3         | 0        | 0         | 3         |
| 3.               | BM6503      | Bio Materials and Artificial Organs              | 3         | 0        | 0         | 3         |
| 4.               | BM6504      | Biomedical Instrumentation                       | 3         | 0        | 0         | 3         |
| 5.               | EC6504      | Microprocessor and Microcontroller               | 3         | 0        | 0         | 3         |
| 6.               | MD6501      | Hospital Management                              | 3         | 0        | 0         | 3         |
| <b>PRACTICAL</b> |             |  |           |          |           |           |
| 7.               | BM6511      | Microprocessor and Microcontroller Laboratory    | 0         | 0        | 3         | 2         |
| 8.               | BM6512      | Bio Medical Instrumentation Laboratory           | 0         | 0        | 3         | 2         |
| 9.               | GE6674      | Communication and Soft Skills - Laboratory Based | 0         | 0        | 4         | 2         |
| <b>TOTAL</b>     |             |  | <b>18</b> | <b>1</b> | <b>10</b> | <b>25</b> |

**BM6501**

**BIO CONTROL SYSTEMS**

**L T P C**  
**3 1 0 4**

**OBJECTIVES:**

- To study the concept and different mathematical techniques applied in analyzing any given system
- To learn the analysis of given system in time domain and frequency domain
- To study the stability analysis of the given system
- To study the concept of physiological control system

**UNIT I MODELING OF SYSTEMS**

**9**

Terminology and basic structure of control system, example of a closed loop system, transfer functions, modeling of electrical systems, translational and rotational mechanical systems, and electro mechanical systems, block diagram and signal flow graph representation of systems, conversion of block diagram to signal flow graph, reduction of block diagram and signal flow graph

**UNIT II TIME RESPONSE ANALYSIS**

**9**

Step and impulse responses of first order and second order systems, determination of time domain specifications of first and second order systems from its output responses, definition of steady state error constants and its computations.

**UNIT III STABILITY ANALYSIS**

**9**

Definition of stability, Routh- Hurwitz criteria of stability, root locus technique, construction of root locus and study of stability, definition of dominant poles and relative stability.

**UNIT IV FREQUENCY RESPONSE ANALYSIS 9**

Frequency response, Nyquist stability criterion, Nyquist plot and determination of closed loop stability, definition of gain margin and phase margin, Bode plot, determination of gain margin and phase margin using Bode plot, use of Nichol's chart to compute response frequency and bandwidth.

**UNIT V PHYSIOLOGICAL CONTROL SYSTEM 9**

Example of physiological control system, difference between engineering and physiological control systems, generalized system properties, models with combination of system elements, linear models of physiological systems-Examples, introduction to simulation.

**TOTAL (L:45+T:15): 60 PERIODS**

**OUTCOMES:**

**The learner will be able to:**

- Analyze the time and frequency domains of the given system using different mathematical techniques

**TEXT BOOKS:**

1. M. Gopal "Control Systems Principles and Design", Tata McGraw Hill, 2002 (Units I, II, III & IV).
2. Michael C K Khoo, "Physiological Control Systems", IEEE Press, Prentice Hall of India, 2001 (Unit V).

**REFERENCES:**

1. Benjamin C. Kuo, "Automatic Control Systems", Prentice Hall of India, 1995.
2. John Enderle Susan Blanchard, Joseph Bronzino "Introduction to Biomedical Engineering", second edition, Academic Press, 2005.
3. Richard C. Dorf, Robert H. Bishop, "Modern control systems", Pearson, 2004.

**BM6502**

**DIAGNOSTIC AND THERAPEUTIC EQUIPMENT- I**

**L T P C  
3 0 0 3**

**OBJECTIVES:**

**The student should be made to:**

- Understand the medical devices applied in measurement of parameters related to cardiology, neurology and the methods of continuous monitoring and transmitting them
- Learn some of the cardiac assist devices
- Learn to measure the signals generated by muscles
- Understand the need and use of some of the extracorporeal devices

**UNIT I CARDIAC EQUIPMENT 9**

Electrocardiograph, Normal and Abnormal Waves, Heart rate monitor, Holter Monitor, Phonocardiography, Plethysmography. Cardiac Pacemaker- Internal and External Pacemaker- Batteries, AC and DC Defibrillator- Internal and External

**UNIT II NEUROLOGICAL EQUIPMENT 9**

Clinical significance of EEG, Multi channel EEG recording system, Epilepsy, Evoked Potential-Visual, Auditory and Somatosensory, MEG (Magneto Encephalo Graph). EEG Bio Feedback Instrumentation.

**UNIT III SKELETAL MUSCULAR EQUIPMENT 9**

Generation of EMG, recording and analysis of EMG waveforms, fatigue characteristics, Muscle stimulators, nerve stimulators, Nerve conduction velocity measurement, EMG Bio Feedback Instrumentation.

**UNIT IV PATIENT MONITORING AND BIOTELEMETRY 9**

Patient monitoring systems, ICU/CCU Equipments, Infusion pumps, bed side monitors, Central consoling controls. Radio Telemetry (single, multi), Portable and Landline Telemetry unit, Applications in ECG and EEG Transmission.

**UNIT V EXTRA CORPOREAL DEVICES AND SPECIAL DIAGNOSTIC TECHNIQUES 9**

Need for heart lung machine, functioning of bubble, disc type and membrane type oxygenators, finger pump, roller pump, electronic monitoring of functional parameter. Hemo Dialyser unit, Lithotripsy, Principles of Cryogenic technique and application, Endoscopy, Laproscopy. Thermography – Recording and clinical application, ophthalmic instruments.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of the course, the student should be able to:**

- Use different medical devices applied in measurement of parameters related to cardiology, neurology
- Explain about cardiac assist devices, its continuous monitoring and transmission
- Measure signals generated by muscles

**TEXT BOOK:**

1. Khandpur R.S, "Handbook of Biomedical Instrumentation", Tata McGraw Hill, New Delhi, 2003.

**REFERENCES:**

1. Myer Kutz, "Standard Handbook of Biomedical Engineering & Design", Mc Graw Hill, 2003.
2. L.A Geddes and L.E.Baker, "Principles of Applied Biomedical Instrumentation", 3<sup>rd</sup> Edition, 2008
3. Leslie Cromwell, "Biomedical Instrumentation and Measurement", Pearson Education, New Delhi, 2007.
4. Antony Y.K.Chan, "Biomedical Device Technology, Principles and design", Charles Thomas Publisher Ltd, Illinois, USA, 2008.
5. Joseph J. Carr and John M. Brown, "Introduction to Biomedical Equipment Technology", Pearson education, 2004.
6. John G.Webster, "Medical Instrumentation Application and Design", third edition, John Wiley and Sons, New York, 2006.

**BM6503**

**BIO MATERIALS AND ARTIFICIAL ORGANS**

**L T P C**

**3 0 0 3**

**OBJECTIVES**

**The student should be made to:**

- Learn characteristics and classification of Biomaterials
- Understand different metals and ceramics used as biomaterials
- Learn polymeric materials and combinations that could be used as a tissue replacement implants
- Know artificial organ developed using these materials

|  |   |          |
|--|---|----------|
| <b>UNIT I</b>  | <b>STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY</b> | <b>9</b> |
| Definition and classification of bio-materials, mechanical properties, visco elasticity, wound healing process, body response to implants, blood compatibility.  |   |          |
| <b>UNIT II</b>   | <b>IMPLANT MATERIALS</b>                                | <b>9</b> |
| Metallic implant materials, stainless steels, co-based alloys, Ti-based alloys, ceramic implant materials, aluminum oxides, hydroxyapatite, glass ceramics, carbons, medical applications.   |   |          |
| <b>UNIT III</b>  | <b>POLYMERIC IMPLANT MATERIALS</b>                      | <b>9</b> |
| Polymerization, polyamides, Acrylic polymers, rubbers, high strength Thermoplastics, medical applications. Bio polymers: Collagen and Elastin. Medical Textiles: Silica, Chitosan, PLA composites, Sutures, wound dressings. Materials for ophthalmology: contact lens, Intraocular lens. Membranes for plasma separation and Blood oxygenation. |   |          |
| <b>UNIT IV</b>   | <b>TISSUE REPLACEMENT IMPLANTS</b>                      | <b>9</b> |
| Small intestinal submucosa and other decellularized matrix biomaterials for tissue repair. Soft tissue replacements, sutures, surgical tapes, adhesive, Percutaneous and skin implants, maxillofacial augmentation, Vascular grafts, hard tissue replacement Implants, joint replacements, Pancreas replacement.                                 |   |          |
| <b>UNIT V</b>  | <b>ARTIFICIAL ORGANS</b>                                | <b>9</b> |
| Artificial blood, Artificial skin, Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenator), Artificial Kidney (Dialyser membrane), Dental Implants.  |   |          |

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of the course, the student should be able to:**

- Analyze different types of Biomaterials and its classification.
- Perform combinations of materials that could be used as a tissue replacement implant.

**TEXT BOOK:**

1. Sujata V. Bhatt, "Biomaterials", Second Edition, Narosa Publishing House, 2005.

**REFERENCES:**

1. Park J.B., "Biomaterials Science and Engineering", Plenum Press, 1984.
2. Myer Kutz, "Standard Handbook of Biomedical Engineering & Design" Mc Graw Hill, 2003
3. John Enderle, Joseph D. Bronzino, Susan M. Blanchard, "Introduction to Biomedical Engineering", Elsevier, 2005.
4. A.C Anand, J F Kennedy, M. Mirafteb, S. Rajendran, "Woodhead Medical Textiles and Biomaterials for Healthcare", Publishing Limited 2006.
5. D F Williams, "Materials Science and Technology: Volume 14, Medical and Dental Materials: A comprehensive Treatment Volume", VCH Publishers 1992.
6. BD Ratner, AS Hoffmann, FJ Schoen, JE Lemmons, "An introduction to Materials in Medicine" Academic Press 1996

**BM6504**

**BIOMEDICAL INSTRUMENTATION**

**L T P C**  
**3 0 0 3**

**OBJECTIVES:**

The students will be exposed to electrical and non-electrical physiological measurements and bioamplifiers.

|  |   |           |
|--|---|-----------|
| <b>UNIT I</b>  | <b>BIO POTENTIAL ELECTRODES</b>                 | <b>9</b>  |
| Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode–skin interface, half cell potential, impedance, polarization effects of electrode – nonpolarizable electrodes. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits. Recording problems - measurement with two electrodes.   |   |           |
| <b>UNIT II</b>   | <b>ELECTRODE CONFIGURATIONS</b>                 | <b>9</b>  |
| Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven’s triangle, standard 12 lead system. EEG – 10-20 electrode system, unipolar, bipolar and average mode. EMG– unipolar and bipolar mode.  |   |           |
| <b>UNIT III</b>  | <b>BIO AMPLIFIER</b>                            | <b>8</b>  |
| Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers – transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference   |   |           |
| <b>UNIT IV</b>   | <b>MEASUREMENT OF NON-ELECTRICAL PARAMETERS</b> | <b>10</b> |
| Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods - auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers - systolic, diastolic, mean detector circuit. Blood flow and cardiac output measurement: Indicator dilution, thermal dilution and dye dilution method, Electromagnetic and ultrasound blood flow measurement. |   |           |
| <b>UNIT V</b>  | <b>BIO-CHEMICAL MEASUREMENT</b>                 | <b>9</b>  |
| Biochemical sensors - pH, pO <sub>2</sub> and pCO <sub>2</sub> , Ion selective Field effect Transistor (ISFET), Immunologically sensitive FET (IMFET), Blood glucose sensors - Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).  |   |           |

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of the course, the student should be able to:**

- Perform electrical and non-electrical physiological measurements
- Explain the function of bio amplifiers.

**TEXT BOOKS:**

1. John G. Webster, “Medical Instrumentation Application and Design”, John Wiley and sons, New York, 2004. (Units I, II & V)
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw-Hill, New Delhi, 2003.(Units II & IV)

**REFERENCES:**

1. Leslie Cromwell, “Biomedical Instrumentation and measurement”, Prentice hall of India, New Delhi, 2007.
2. Myer Kutz, “Standard Handbook of Biomedical Engineering and Design”, McGraw Hill Publisher, 2003.
3. Joseph J. Carr and John M. Brown, “Introduction to Biomedical Equipment Technology”, Pearson Education, 2004.

EC6504

MICROPROCESSOR AND MICROCONTROLLER

L T P C  
3 0 0 3

**OBJECTIVES:**

The student should be made to:

- Study the Architecture of 8086 microprocessor.
- Learn the design aspects of I/O and Memory Interfacing circuits.
- Study about communication and bus interfacing.
- Study the Architecture of 8051 microcontroller.

**UNIT I THE 8086 MICROPROCESSOR**

9

Introduction to 8086 – Microprocessor architecture – Addressing modes - Instruction set and assembler directives – Assembly language programming – Modular Programming - Linking and Relocation - Stacks - Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation.

**UNIT II 8086 SYSTEM BUS STRUCTURE**

9

8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming – System Bus Structure - Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

**UNIT III I/O INTERFACING**

9

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller – Interrupt controller – DMA controller – Programming and applications Case studies: Traffic Light control, LED display , LCD display, Keyboard display interface and Alarm Controller.

**UNIT IV MICROCONTROLLER**

9

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits - Instruction set - Addressing modes - Assembly language programming.

**UNIT V INTERFACING MICROCONTROLLER**

9

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing - External Memory Interface- Stepper Motor and Waveform generation.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

At the end of the course, the student should be able to:

- Design and implement programs on 8086 microprocessor.
- Design I/O circuits.
- Design Memory Interfacing circuits.
- Design and implement 8051 microcontroller based systems.

**TEXT BOOKS:**

1. Yu-Cheng Liu, Glenn A.Gibson, “Microcomputer Systems: The 8086 / 8088 Family - Architecture, Programming and Design”, Second Edition, Prentice Hall of India, 2007.
2. Mohamed Ali Mazidi, Janice Gillispie Mazidi, Rolin McKinlay, “The 8051 Microcontroller and Embedded Systems: Using Assembly and C”, Second Edition, Pearson education,2011

**REFERENCE:**

1. Douglas V.Hall, “Microprocessors and Interfacing, Programming and Hardware:;TMH,2012

MD6501

HOSPITAL MANAGEMENT

L T P C

3 0 0 3

**OBJECTIVES:**

**The student should be made to:**

Understand the principles, practices and areas of application in Hospital management.

**UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION 8**

Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning – Equipment Planning – Functional Planning - Current Issues in Hospital Management - Telemedicine - Bio-Medical Waste Management

**UNIT II HUMAN RESOURCE MANAGEMENT IN HOSPITAL 9**

Principles of HRM – Functions of HRM – Profile of HRD Manager – Tools of HRD –Human Resource Inventory – Manpower Planning. Different Departments of Hospital, Recruitment, Selection, Training Guidelines –Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

**UNIT III MARKETING RESEARCH & CONSUMER BEHAVIOUR 10**

Marketing information systems - assessing information needs, developing & disseminating information - Market Research process - Other market research considerations – Consumer Markets & Consumer Buyer Behaviour - Model of consumer behaviour - Types of buying decision behaviour - The buyer decision process - Model of business buyer behaviour – Major types of buying situations - global marketing in the medical sector - WTO and its implications

**UNIT IV HOSPITAL INFORMATION SYSTEMS & SUPPORTIVE SERVICES 9**

Management Decisions and Related Information Requirement - Clinical Information Systems - Administrative Information Systems - Support Service Technical Information Systems – Medical Transcription, Medical Records Department – Central Sterilization and Supply Department – Pharmacy– Food Services - Laundry Services.

**UNIT V QUALITY AND SAFETY ASPECTS IN HOSPITAL 9**

Quality system – Elements, implementation of quality system, Documentation, Quality auditing, International Standards ISO 9000 – 9004 – Features of ISO 9001 – ISO 14000 – Environment Management Systems. NABA, JCI, NABL. Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules. Health Insurance & Managing Health Care – Medical Audit – Hazard and Safety in a hospital Setup.

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of the course, the student should be able to:**

- Explain the principles, practices and areas of application in Hospital Management.

**TEXT BOOKS:**

1. R.C.Goyal, “Hospital Administration and Human Resource Management”, PHI – Fourth Edition, 2006 (Units I, II & III).
2. G.D.Kunders, “Hospitals – Facilities Planning and Management – TMH, New Delhi – Fifth Reprint 2007 (Units III, IV & V).

**REFERENCES:**

1. Cesar A.Caceres and Albert Zara, “The Practice of Clinical Engineering, Academic Press, New York, 1977.
2. Norman Metzger, “Handbook of Health Care Human Resources Management”, 2<sup>nd</sup> edition Aspen Publication Inc. Rockville, Maryland, USA, 1990.

3. Peter Berman "Health Sector Reform in Developing Countries" - Harvard University Press, 1995.
4. William A. Reinke "Health Planning For Effective Management" - Oxford University Press.1988
5. Blane, David, Brunner, "Health and SOCIAL Organization: Towards a Health Policy for the 21<sup>st</sup> Century" Eric Calrendon Press 2002.
6. Arnold D. Kalcizony & Stephen M. Shortell, "Health Care Management", 6<sup>th</sup> Edition Cengage Learning, 2011.

**BM6511                    MICROPROCESSOR AND MICROCONTROLLER LABORATORY**

**L T P C**  
**0 0 3 2**

**OBJECTIVES:**

**The student should be made to:**

- Introduce ALP concepts and features
- Write ALP for arithmetic and logical operations in 8086 and 8051
- Differentiate Serial and Parallel Interface
- Interface different I/Os with Microprocessors
- Be familiar with MASM

**LIST OF EXPERIMENTS:**

**8086 Programs using kits and MASM**

1. Basic arithmetic and Logical operations
2. Move a data block without overlap
3. Code conversion, decimal arithmetic and Matrix operations.
4. Floating point operations, string manipulations, sorting and searching
5. Password checking, Print RAM size and system date
6. Counters and Time Delay

**Peripherals and Interfacing Experiments**

7. Traffic light control
8. Stepper motor control
9. Digital clock
10. Key board and Display
11. Printer status
12. Serial interface and Parallel interface
13. A/D and D/A interface and Waveform Generation

**8051 Experiments using kits and MASM**

14. Basic arithmetic and Logical operations
15. Square and Cube program, Find 2's complement of a number
16. Unpacked BCD to ASCII

**TOTAL: 45 PERIODS**

**OUTCOMES:**

**At the end of the course, the student should be able to:**

- Write ALP Programmes for fixed and Floating Point and Arithmetic
- Interface different I/Os with processor
- Generate waveforms using Microprocessors
- Execute Programs in 8051
- Explain the difference between simulator and Emulator



**LAB EQUIPMENT FOR A BATCH OF 30 STUDENTS:**

**HARDWARE:**

- 8086 development kits - 30 nos
- Interfacing Units - Each 10 nos
- Microcontroller - 30 nos

**SOFTWARE:**

- Intel Desktop Systems with MASM - 30 nos
- 8086 Assembler
- 8051 Cross Assembler

**BM6512**

**BIO MEDICAL INSTRUMENTATION LABORATORY**

**L T P C**  
**0 0 3 2**

**OBJECTIVES:**

- To provide hands on training on Measurement of physiological parameters , biochemical parameters measurement and biosignal analysis.

**LIST OF EXPERIMENTS:**

1. Design and analysis of biological pre amplifiers
2. Recording of ECG signal and analysis
3. Recording of EMG-Signal
4. Recording of EEG-Signal
5. Recording of various physiological parameters using patient monitoring system and telemetry units.
6. Measurement of pH and conductivity.
7. Measurement and recording of peripheral blood flow
8. Measurement of visually evoked potential.
9. Study of characteristics of optical Isolation amplifier
10. Galvanic skin resistance (GSR) measurement

**TOTAL: 45 PERIODS**

**LAB REQUIREMENTS FOR A BATCH OF 30 STUDENTS:**

- Multiparameter patient monitoring system : 1 No.
- EEG recorder with accessories for evoked studies : 1 No.
- ECG recorder : 1 No.
- EMG recorder : 1 No.
- pH meter, conductivity meter : 1 No.
- Blood flow measurement system using ultrasound transducer: 1 No.
- GSR measurement setup. : 1 No.
- Function Generators
- DSOs
- Regulated Power supplies
- Bread boards
- IC 741

**OUTCOMES:**

**Student is able to:**

- Design the amplifier for Bio signal measurements
- Recording and analysis of bio signals

**GE6674 COMMUNICATION AND SOFT SKILLS - LABORATORY BASED**

**L T P C**  
**0 0 4 2**

**OBJECTIVES:**

- To enable learners to develop their communicative competence.
- To facilitate them to hone their soft skills.
- To equip them with employability skills to enhance their prospect of placements.

**UNIT I LISTENING AND SPEAKING SKILLS 12**

Conversational skills (formal and informal) – group discussion and interview skills – making presentations.

Listening to lectures, discussions, talk shows, news programmes, dialogues from TV/radio/Ted talk/Podcast – watching videos on interesting events on Youtube.

**UNIT II READING AND WRITING SKILLS 12**

Reading different genres of tests ranging from newspapers to philosophical treatises – reading strategies such as graphic organizers, summarizing and interpretation.

Writing job applications – cover letter – resume – emails – letters – memos – reports – blogs – writing for publications.

**UNIT III ENGLISH FOR NATIONAL AND INTERNATIONAL EXAMINATIONS AND PLACEMENTS 12**

International English Language Testing System (IELTS) – Test of English as a Foreign Language (TOEFL) – Graduate Record Examination (GRE) – Civil Service (Language related) – Verbal ability.

**UNIT IV SOFT SKILLS (1) 12**

Motivation – self image – goal setting – managing changes – time management – stress management – leadership traits – team work – career and life planning.

**UNIT V SOFT SKILLS (2) 12**

Multiple intelligences – emotional intelligence – spiritual quotient (ethics) – intercultural communication – creative and critical thinking – learning styles and strategies.

**TOTAL: 60 PERIODS**

**TEACHING METHODS:**

1. To be totally learner-centric with minimum teacher intervention as the course revolves around practice.
2. Suitable audio/video samples from Podcast/YouTube to be used for illustrative purposes.
3. Portfolio approach for writing to be followed. Learners are to be encouraged to blog, tweet, text and email employing appropriate language.
4. GD/Interview/Role Play/Debate could be conducted off the laboratory (in a regular classroom) but learners are to be exposed to telephonic interview and video conferencing.
5. Learners are to be assigned to read/write/listen/view materials outside the classroom as well for gaining proficiency and better participation in the class.

**LAB INFRASTRUCTURE:**

| S. No. | Description of Equipment (minimum configuration) | Qty Required |
|--------|--|--------------|
| 1      | <b>Server</b>                                    | 1 No.        |
|        | • PIV System                                     |              |
|        | • 1 GB RAM / 40 GB HDD                           |              |
|        | • OS: Win 2000 server                            |              |
|        | • Audio card with headphones                     |              |

|   |   |         |
|---|---|---------|
|   | <ul style="list-style-type: none"> <li>• JRE 1.3</li> </ul>                       |         |
| 2 | <b>Client Systems</b>   | 60 Nos. |
|   | <ul style="list-style-type: none"> <li>• PIII System</li> </ul>                   |         |
|   | <ul style="list-style-type: none"> <li>• 256 or 512 MB RAM / 40 GB HDD</li> </ul> |         |
|   | <ul style="list-style-type: none"> <li>• OS: Win 2000</li> </ul>                  |         |
|   | <ul style="list-style-type: none"> <li>• Audio card with headphones</li> </ul>    |         |
|   | <ul style="list-style-type: none"> <li>• JRE 1.3</li> </ul>                       |         |
| 3 | Handicam  | 1 No.   |
| 4 | Television 46"  | 1 No.   |
| 5 | Collar mike   | 1 No.   |
| 6 | Cordless mike   | 1 No.   |
| 7 | Audio Mixer   | 1 No.   |
| 8 | DVD recorder/player   | 1 No.   |
| 9 | LCD Projector with MP3/CD/DVD provision for Audio/video facility                  | 1 No.   |

**EVALUATION:**

**INTERNAL: 20 MARKS**

Record maintenance: Students should write a report on a regular basis on the activities conducted, focusing on the details such as the description of the activity, ideas emerged, learning outcomes and so on. At the end of the semester records can be evaluated out of 20 marks.

**EXTERNAL: 80 MARKS**

- Online Test - 35 marks
- Interview - 15 marks
- Presentation - 15 marks
- Group Discussion - 15 marks

**NOTE ON INTERNAL AND EXTERNAL EVALUATION:**

1. Interview – mock interview can be conducted on one-on-one basis.
2. Speaking – example for role play:
  - a. Marketing engineer convincing a customer to buy his product.
  - b. Telephonic conversation- fixing an official appointment / placing an order / enquiring and so on.
3. Presentation – should be extempore on simple topics.
4. Discussion – topics of different kinds; general topics, case studies and abstract concept.

**OUTCOMES:**

**At the end of the course, learners should be able to**

- Take international examination such as IELTS and TOEFL
- Make presentations and Participate in Group Discussions.
- Successfully answer questions in interviews.

**REFERENCES:**

1. Business English Certificate Materials, Cambridge University Press.
2. Graded Examinations in Spoken English and Spoken English for Work downloadable materials from Trinity College, London.
2. International English Language Testing System Practice Tests, Cambridge University Press.
3. Interactive Multimedia Programs on Managing Time and Stress.
4. Personality Development (CD-ROM), Times Multimedia, Mumbai.
5. Robert M Sherfield and et al. "Developing Soft Skills" 4th edition, New Delhi: Pearson Education, 2009.

**WEB SOURCES:**

<http://www.slideshare.net/rohitish/presentation-on-group-discussion>

[http://www.washington.edu/doi/TeamN/present\\_tips.html](http://www.washington.edu/doi/TeamN/present_tips.html)

<http://www.oxforddictionaries.com/words/writing-job-applications>

<http://www.kent.ac.uk/careers/cv/coveringletters.htm>

[http://www.mindtools.com/pages/article/newCDV\\_34.htm](http://www.mindtools.com/pages/article/newCDV_34.htm)