



# VEL TECH MULTI TECH

Dr RANGARAJAN Dr. SAKUNTHALA ENGINEERING COLLEGE

(Owned by Vel Trust 1997)

*(An ISO 9001: 2008 Certified Institution)*

Accredited By NAAC with 'A' Grade and NBA Accredited  
Institution

(Approved by AICTE New Delhi and Govt. of Tamil Nadu, Affiliated to  
Anna University Chennai)



## SYLLABUS

### WEEKLY SCHEDULE

V SEMESTER 2016-17

## DEPARTMENT OF BIO MEDICAL ENGINEERING

### IV YEAR DEGREE COURSE

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## **WEEK DETAILS**

<b>SL.NO.</b>	<b>WEEK</b>	<b>FROM</b>	<b>TO</b>
1	<b>WEEK1</b>	<b>24.06.2016</b>	<b>25.06.2016</b>
2	<b>WEEK2</b>	<b>27.06.2016</b>	<b>02.07.2016</b>
3	<b>WEEK3</b>	<b>04.07.2016</b>	<b>09.07.2016</b>
4	<b>WEEK4</b>	<b>11.07.2016</b>	<b>16.07.2016</b>
5	<b>WEEK5</b>	<b>18.07.2016</b>	<b>23.07.2016</b>
6	<b>WEEK6</b>	<b>25.07.2016</b>	<b>30.07.2016</b>
7	<b>WEEK7</b>	<b>01.08.2016</b>	<b>06.08.2016</b>
8	<b>WEEK8</b>	<b>08.08.2016</b>	<b>13.08.2016</b>
9	<b>WEEK9</b>	<b>16.08.2016</b>	<b>20.08.2016</b>
10	<b>WEEK10</b>	<b>22.08.2016</b>	<b>27.08.2016</b>
11	<b>WEEK11</b>	<b>29.08.2016</b>	<b>03.09.2016</b>
12	<b>WEEK12</b>	<b>06.09.2016</b>	<b>10.09.2016</b>
13	<b>WEEK13</b>	<b>12.09.2016</b>	<b>17.09.2016</b>
14	<b>WEEK14</b>	<b>19.09.2016</b>	<b>24.09.2016</b>
15	<b>WEEK15</b>	<b>26.09.2016</b>	<b>01.10.2016</b>
16	<b>WEEK16</b>	<b>03.10.2016</b>	<b>08.10.2016</b>
17	<b>WEEK17</b>	<b>13.10.2016</b>	<b>15.10.2016</b>
18	<b>WEEK18</b>	<b>17.10.2016</b>	<b>22.10.2016</b>

## SUBJECT CONTENTS

<b>SL.NO</b>	<b>SUBJECT CODE</b>	<b>SUBJECT NAME</b>
<b>THEORY</b>		
1	BM6501	Bio Control Systems
2	BM6502	Diagnostic and Therapeutic Equipment - I
3	BM6503	Bio Materials and Artificial Organs
4	BM6504	Biomedical Instrumentation
5	EC6504	Microprocessor and Microcontroller
6	MD6501	Hospital Management
<b>PRACTICAL</b>		
7	BM6511	Microprocessor and Microcontroller Laboratory
8	BM6512	Bio Medical Instrumentation Laboratory
9	GE6674	Communication and Soft Skills - Laboratory Based

**TEST / EXAM SCHEDULE**

<b>SL. NO</b>	<b>SUBJECT CODE</b>	<b>SUBJECT NAME</b>	<b>UNIT TEST I</b>	<b>UNIT TEST II</b>	<b>Pre Model Exam</b>	<b>MODEL EXAM</b>
1	BM6501	Bio Control Systems	14.07.2016 FN	01.08.2016 FN	06.09.2016	04.10.2016
2	BM6502	Diagnostic and Therapeutic Equipment - I	14.07.2016 AN	01.08.2016 AN	07.09.2016	06.10.2016
3	BM6503	Bio Materials and Artificial Organs	15.07.2016 FN	02.08.2016 FN	08.09.2016	08.10.2016
4	BM6504	Biomedical Instrumentation	15.07.2016 AN	02.08.2016 AN	09.09.2016	13.10.2016
5	EC6504	Microprocessor and Microcontroller	16.07.2016 FN	03.08.2016 FN	10.09.2016	15.10.2016
6	MD6501	Hospital Management	16.07.2016 AN	03.08.2016 AN	12.09.2016	17.10.2016

# **BM6501 BIO CONTROL SYSTEMS**

## **UNIT I MODELING OF SYSTEMS**

### **WEEK 1:**

Terminology and basic structure of control system, example of a closed loop system, transfer functions, modeling of electrical systems,

### **WEEK 2:**

Translational and rotational mechanical systems, and electro mechanical systems, block diagram and signal flow graph representation of systems

### **WEEK 3:**

Conversion of block diagram to signal flow graph, reduction of block diagram and signal flow graph

## **UNIT II TIME RESPONSE ANALYSIS**

### **WEEK 4: UNIT TEST I**

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

### **WEEK 5:**

Definition of steady state error constants and its computations.

### **WEEK 6: UNIT TEST II**

## **UNIT III STABILITY ANALYSIS**

Definition of stability, Routh- Hurwitz criteria of stability, root locus technique,

### **WEEK 8:**

Construction of root locus and study of stability, definition of dominant poles and relative stability

## **UNIT IV FREQUENCY RESPONSE ANALYSIS**

### **WEEK 9: UNIT TEST III**

Frequency response, Nyquist stability criterion, Nyquist plot and determination of closed loop stability, definition of gain margin and phase margin.

### **WEEK 10:**

Bode plot, determination of gain margin and phase margin using Bode plot, use of Nichol's chart to compute response frequency and bandwidth.

### **WEEK 11: UNIT TEST IV**

## **UNIT V PHYSIOLOGICAL CONTROL SYSTEM**

### **WEEK 12:**

Example of physiological control system, difference between engineering and physiological control systems, generalized system properties

### **WEEK 13:**

Models with combination of system elements, linear models of physiological systems-Examples, introduction to simulation.

### **WEEK 14: UNIT TEST V**

### **WEEK 15: ICD CLASSES**

### **WEEK 16: MODEL EXAM**

### **WEEK 17: MODEL EXAM**

### **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**

### **UNIT I CARDIAC EQUIPMENT**

#### **WEEK 1:**

Electrocardiograph, Normal and Abnormal Waves, Heart rate monitor, Holter Monitor, Phonocardiography

#### **WEEK 2:**

Plethysmography. Cardiac Pacemaker

#### **WEEK 3:**

Internal and External Pacemaker–Batteries, AC and DC Defibrillator- Internal and External

### **UNIT II NEUROLOGICAL EQUIPMENT**

#### **WEEK 4: UNIT TEST I**

Clinical significance of EEG, Multi channel EEG recording system, Epilepsy

#### **WEEK 5:**

Evoked Potential–Visual, Auditory and Somatosensory, MEG (Magneto Encephalo Graph). EEG Bio Feedback Instrumentation

#### **WEEK 6: UNIT TEST II**



## **UNIT III SKELETAL MUSCULAR EQUIPMENT**

### **WEEK 7:**

Generation of EMG, recording and analysis of EMG waveforms, fatigue characteristics, Muscle stimulators, nerve stimulators,

### **WEEK 8:**

Nerve conduction velocity measurement, EMG Bio Feedback Instrumentation.

## **UNIT IV PATIENT MONITORING AND BIOTELEMETRY**

### **WEEK 9: UNIT TEST III**

Patient monitoring systems, ICU/CCU Equipments, Infusion pumps, bed side monitors, Central consoling controls

### **WEEK 10:**

Radio Telemetry (single, multi), Portable and Landline Telemetry unit, Applications in ECG and EEG Transmission.

### **WEEK 11: UNIT TEST IV**

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

### **WEEK 12:**

Need for heart lung machine, functioning of bubble, disc type and membrane type oxygenators, finger pump, roller pump, electronic monitoring of functional parameter.

### **WEEK 13:**

Hemo Dialyser unit, Lithotripsy, Principles of Cryogenic technique and application, Endoscopy, Laproscopy. Thermography – Recording and clinical application, ophthalmic instruments.

### **WEEK 14: UNIT TEST V**

### **WEEK 15: ICD CLASSES**

## **WEEK 16: MODEL EXAM**

## **WEEK 17: MODEL EXAM**

### **TEXT BOOKS:**

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”, 3rd 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**

### **UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY**

#### **WEEK 1:**

Definition and classification of bio-materials

#### **WEEK 2:**

Mechanical properties, visco elasticity, wound healing process,

#### **WEEK 3:**

Body response to implants, blood compatibility.

## **UNIT II IMPLANT MATERIALS**

### **WEEK 4: UNIT TEST I**

Metallic implant materials, stainless steels, Co-based alloys, Ti-based alloys, ceramic implant Materials

### **WEEK 5:**

Aluminum oxides, hydroxyapatite, glass ceramics, carbons, medical applications

### **WEEK 6: UNIT TEST II**

## **UNIT III POLYMERIC IMPLANT MATERIALS**

### **WEEK 7:**

Polymerization, polyamides, Acrylic polymers, rubbers, high strength Thermoplastics, medical applications. Bio polymers: Collagen and Elastin. Medical Textiles: Silica, Chitosan, PLA composites, Sutures, wound dressings.

### **WEEK 8:**

Materials for ophthalmology: contact lens, Intraocular lens. Membranes for plasma separation and Blood oxygenation

## **UNIT IV TISSUE REPLACEMENT IMPLANTS**

### **WEEK 9: UNIT TEST III**

Small intestinal submucosa and other decellularized matrix biomaterials for tissue repair. Soft tissue replacements, sutures, surgical tapes

### **WEEK 10:**

Adhesive, Percutaneous and skin implants, maxillofacial augmentation, Vascular grafts, hard tissue replacement Implants, joint replacements, Pancreas replacement.

### **WEEK 11: UNIT TEST IV**

## **UNIT V ARTIFICIAL ORGANS**

**WEEK 12:**

Artificial blood, Artificial skin, Artificial Heart, Prosthetic Cardiac Valves

**WEEK 13:**

Artificial lung (oxygenator), Artificial Kidney (Dialyser membrane), Dental Implants.

**WEEK 14: UNIT TEST V****WEEK 15: ICD CLASSES****WEEK 16: MODEL EXAM****WEEK 17: MODEL EXAM****TEXT BOOKS:**

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.Miraftab, 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**

## **UNIT I BIO POTENTIAL ELECTRODES**

### **WEEK 1:**

Origin of bio potential and its propagation. Electrode-electrolyte interface, electrode–skin interface, half cell potential, impedance, polarization effects of electrode

### **WEEK 2:**

nonpolarizable electrodes. Types of electrodes - surface, needle and micro electrodes and their equivalent circuits

### **WEEK 3:**

Recording problems - measurement with two electrodes.

## **UNIT II ELECTRODE CONFIGURATIONS**

### **WEEK 4: UNIT TEST I**

Biosignals characteristics – frequency and amplitude ranges. ECG – Einthoven’s triangle, standard 12 lead system. EEG – 10-20 electrode system

### **WEEK 5:**

Unipolar, bipolar and average mode. EMG– unipolar and bipolar mode.

### **WEEK 6: UNIT TEST II**

## **UNIT III BIO AMPLIFIER**

### **WEEK 7:**

Need for bio-amplifier - single ended bio-amplifier, differential bio-amplifier – right leg driven ECG amplifier. Band pass filtering, isolation amplifiers

### **WEEK 8:**

Transformer and optical isolation - isolated DC amplifier and AC carrier amplifier. Chopper amplifier. Power line interference

## **UNIT IV MEASUREMENT OF NON-ELECTRICAL PARAMETERS**

### **WEEK 9: UNIT TEST III**

Temperature, respiration rate and pulse rate measurements. Blood Pressure: indirect methods -auscultatory method, oscillometric method, direct methods: electronic manometer, Pressure amplifiers

### **WEEK 10:**

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.

### **WEEK 11: UNIT TEST IV.**

## **UNIT V BIO-CHEMICAL MEASUREMENT**

### **WEEK 12:**

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

### **WEEK 13:**

Blood gas analyzers, colorimeter, flame photometer, spectrophotometer, blood cell counter, auto analyzer (simplified schematic description).

### **WEEK 14: UNIT TEST V**

### **WEEK 15: ICD CLASSES**

### **WEEK 16: MODEL EXAM**

### **WEEK 17: MODEL EXAM**

### **TEXT BOOK:**

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**

### **UNIT I THE 8086 MICROPROCESSOR**

#### **WEEK 1**

Introduction to 8086 – Microprocessor architecture – Addressing modes  
- Instruction set and assembler directives

#### **WEEK 2:**

Assembly language programming – Modular Programming - Linking and Relocation – Stacks

#### **WEEK 3**

Procedures – Macros – Interrupts and interrupt service routines – Byte and String Manipulation

### **UNIT II 8086 SYSTEM BUS STRUCTURE**

#### **WEEK 4: UNIT TEST I**

8086 signals – Basic configurations – System bus timing –System design using 8086 – IO programming – Introduction to Multiprogramming

**WEEK 5:**

System Bus Structure – Multiprocessor configurations – Coprocessor, Closely coupled and loosely Coupled configurations – Introduction to advanced processors.

**WEEK 6: UNIT TEST II****UNIT III I/O INTERFACING****WEEK 7:**

Memory Interfacing and I/O interfacing - Parallel communication interface – Serial communication interface – D/A and A/D Interface - Timer – Keyboard /display controller

**WEEK 8:**

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****WEEK 9: UNIT TEST III**

Architecture of 8051 – Special Function Registers(SFRs) - I/O Pins Ports and Circuits

**WEEK 10:**

Instruction set - Addressing modes - Assembly language programming.

**WEEK 12: UNIT TEST IV****UNIT V INTERFACING MICROCONTROLLER**

Programming 8051 Timers - Serial Port Programming - Interrupts Programming – LCD & Keyboard Interfacing - ADC, DAC & Sensor Interfacing

**WEEK 13:**

External Memory Interface- Stepper Motor and Waveform generation.



**WEEK 14: UNIT TEST V**

**WEEK 15: ICD CLASSES**

**WEEK 16: MODEL EXAM**

**WEEK 17: MODEL EXAM**

**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

**REFERENCES:**

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

## **MD6501 HOSPITAL MANAGEMENT**

### **UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION**

#### **WEEK 1:**

Distinction between Hospital and Industry, Challenges in Hospital Administration – Hospital Planning – Equipment Planning

#### **WEEK 2:**

Functional Planning - Current Issues in Hospital Management

#### **WEEK 3:**

Telemedicine - Bio-Medical Waste Management

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

### **WEEK 4: UNIT TEST I**

Principles of HRM – Functions of HRM – Profile of HRD Manager – Tools of HRD – Human Resource Inventory – Manpower Planning

### **WEEK 5:**

Different Departments of Hospital, Recruitment, Selection, Training Guidelines – Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

### **WEEK 6: UNIT TEST II**

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

### **WEEK 7:**

Marketing information systems - assessing information needs, developing & disseminating information - Market Research process - Other market research considerations – Consumer Markets & Consumer Buyer Behaviour - Model of consumer behavior

### **WEEK 8**

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**

### **WEEK 9: UNIT TEST III**

Management Decisions and Related Information Requirement - Clinical Information Systems - Administrative Information Systems - Support Service Technical Information Systems

### **WEEK 10:**

Medical Transcription, Medical Records Department – Central Sterilization and Supply Department – Pharmacy– Food Services - Laundry Services.

### **WEEK 11: UNIT TEST IV**

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

### **WEEK 12:**

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

### **WEEK 13:**

Loss Prevention – Fire Safety – Alarm System – Safety Rules. Health Insurance & Managing Health Care – Medical Audit – Hazard and Safety in a hospital Setup.

### **WEEK 14: UNIT TEST V**

### **WEEK 15: ICD CLASSES**

### **WEEK 16: MODEL EXAM**

### **WEEK 17: MODEL EXAM**

### **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”, 2nd edition Aspen Publication Inc. Rockville, Maryland, USA, 1990.57

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”, 6th Edition Cengage Learning, 2011.

## **BM6511 MICROPROCESSOR AND MICROCONTROLLER LABORATORY**

### **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

## **BM6512 BIO MEDICAL INSTRUMENTATION LABORATORY**

### **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

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

## **UNIT I LISTENING AND SPEAKING SKILLS**

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**

Reading different genres of texts 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**

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)**

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

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

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

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