



**VEL TECH MULTI TECH
Dr RANGARAJAN Dr.SAKUNTHALA
ENGINEERING COLLEGE**

(An ISO 9001: 2008 Certified Institution)

(Owned by Vel Trust)

(Approved by Govt. of Tamil Nadu and affiliated to Anna University)



SYLLABUS

WEEKLY SCHEDULE

V SEMESTER

2014 - 2015

**DEPARTMENT OF BIO MEDICAL
ENGINEERING**

IV YEAR DEGREE COURSE

42, Avadi – Alamathi Road,

Chennai – 600062

Telefax – 044-26841061

E-mail: emailto@veltechmultitech.org

Website : www.veltechmultitech.org



WEEK DETAILS

SL.NO.	WEEK	FROM	TO
1	WEEK1	24-06-2014	27-06-2014
2	WEEK2	30-06-2014	04-07-2014
3	WEEK3	07-07-2014	11-07-2014
4	WEEK4	14-07-2014	18-07-2014
5	WEEK5	21-07-2014	25-07-2014
6	WEEK6	28-07-2014	01-08-2014
7	WEEK7	04-08-2014	08-08-2014
8	WEEK8	11-08-2014	14-08-2014
9	WEEK9	18-08-2014	22-08-2014
10	WEEK10	25-08-2014	28-08-2014
11	WEEK11	01-09-2014	05-09-2014
12	WEEK12	08-09-2014	12-09-2014
13	WEEK13	15-09-2014	19-09-2014
14	WEEK14	22-09-2014	26-09-2014
15	WEEK15	29-09-2014	01-10-2014
16	WEEK16	06-10-2014	10-10-2014
17	WEEK17	13-10-2014	17-10-2014
18	WEEK18	20-10-2014	24-10-2014
19	WEEK19	27-10-2014	31-10-2014

SUBJECT CONTENTS

SL.NO	SUBJECT CODE	SUBJECT NAME
THEORY		
1	BM2305	Digital signal processing
2	BM2301	Bio control systems
3	BM2302	Diagnostic and therapeutic equipment
4	BM2303	Biomaterials and artificial organs
5	EC2363	Microprocessor, microcontroller and system design
6	BM2304	Hospital management
PRACTICAL		
7	BM2306	Microprocessor & microcontroller lab
8	BM2307	Biomedical instrumentation lab
9	GE2321	Communication skills lab

TEST / EXAM SCHEDULE

SL.NO	SUBJECT CODE	SUBJECT NAME	UNIT TEST I	UNIT TEST II	UNIT TEST III	UNIT TEST IV	UNIT TEST V
1	BM2305	Digital signal processing	08/07/14 FN	30/07/14 FN	20/08/14 FN	09/09/14 FN	29/09/14 FN
2	BM2301	Bio control systems	08/07/14 AN	30/07/14 AN	20/08/14 AN	09/09/14 AN	29/09/14 AN
3	BM2302	Diagnostic and therapeutic equipment	09/07/14 FN	31/07/14 FN	21/08/14 FN	10/09/14 FN	30/09/14 FN
4	BM2303	Biomaterials and artificial organs	09/07/14 AN	31/07/14 AN	21/08/14 AN	10/09/14 AN	30/09/14 AN
5	EC2363	Microprocessor, microcontroller and system design	10/07/14 FN	01/08/14 FN	22/08/14 FN	11/09/14 FN	01/10/14 FN
6	BM2304	Hospital management	10/07/14 AN	01/08/14 AN	22/08/14 AN	11/09/14 AN	01/10/14 AN

SL.NO	SUBJECT CODE	SUBJECT NAME	MODEL EXAM
1	BM2305	Digital signal processing	13-10-2014
2	BM2301	Bio control systems	14-10-2014
3	BM2302	Diagnostic and therapeutic equipment	15-10-2014
4	BM2303	Biomaterials and artificial organs	16-10-2014
5	EC2363	Microprocessor, microcontroller and system design	17-10-2014
6	BM2304	Hospital management	20-10-2014

BM2305 DIGITAL SIGNAL PROCESSING

UNIT I FINITE IMPULSE RESPONSE (FIR) FILTER

WEEK 1: Introduction to FIR filter - phase delay and group delay – linear phase transfer function. Design of FIR filter using Fourier method, Rectangular window,

WEEK 2: Hanning window, Hamming window, Kaiser Window. Design using frequency sampling technique.

WEEK 3: Structure realization of FIR system – direct form, cascade form, linear phase FIR system.

UNIT II INFINITE IMPULSE RESPONSE (IIR) FILTER

WEEK 4: UNIT TEST-I

Introduction to IIR filter - Impulse-invariant transformation technique-Bilinear-Transformation technique – frequency transformation in digital domain

WEEK 5: Design of Butterworth filter and Chebyshev filter (type-1) (restricted to 3rd order). Structure

Realization of IIR system – lattice structure and lattice-ladder structure.

WEEK 6: UNIT TEST-II

UNIT III FINITE WORD LENGTH EFFECT IN FIR AND IIR FILTER

WEEK 7: Quantization of fixed-point and floating-point numbers – product quantization – variance Estimation of quantization error – finite word length effect on IIR filter –

WEEK 8: Product Quantization error in IIR filter – mathematical analysis of steady state output noise –

Dynamic scaling to prevent overflow – limit-cycle oscillation in recursive system –Rounding-off error in DFT and FFT computation.

UNIT IV BASICS OF RANDOM SIGNAL PROCESSING (ONLY QUALITATIVE ANALYSIS)

WEEK 9: UNIT TEST-III

Introduction to probability function, joint probability, conditional probability – estimation

Parameters – joint distribution function, probability density function, ensemble average – mean squared value, variance, standard deviation, moments,

WEEK 10: correlation, covariance, orthogonally, auto-covariance, auto-correlation, cross-covariance and cross-correlation stationarity – ergodic – white noise – energy density spectrum – power density spectrum estimation – periodogram – direct method, indirect method, Barlett method Welch method. Decimator (down sampling) – frequency-domain analysis of decimator – interpolation (up sampling) – frequency-domain analysis of interpolator

WEEK 11: UNIT TEST-IV

UNIT V INTRODUCTION TO DIGITAL SIGNAL PROCESSORS

WEEK 12: Programmable DSP – multiplier accumulator – over-flow and under-flow in MAC unit – Van-Neumann architecture, Harvard architecture – cache memory – pipelining

WEEK 13: Computer configuration – RISC – CISC – addressing modes – replication – TMS320 processor – first to fifth generation (only block diagram approach) – architecture and features.

WEEK 14: UNIT TEST-V

WEEK 15: ICD CLASSES

WEEK 16: MODEL EXAM

TEXT BOOKS:

1. E. C. Ifeachor and B.W. Jervis, “Digital Signal processing – A Practical Approach”, Pearson education, New Delhi, 4th Edition, 2004.
2. John G. Proakis and Dimitris G. Manolakis, “Digital Signal Processing, Algorithms Edition, 2007.

REFERENCES:

1. Sanjit K. Mitra, “Digital Signal Processing – A computer Based Approach”, TMH, New Delhi, 1998
2. Andreas Antoniou, Digital filter Analysis and Design”, Prentice Hall India
3. R. Rabiner and B. Gold, “Theory and Application of Digital Signal processing”, PHI

BM2301 BIOCONTROL SYSTEMS

UNIT I CONTROL SYSTEM MODELLING

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, electromechanical systems, block diagram and

WEEK 3: 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

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. Definition of steady state error constants and its computation,

WEEK 5: 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 .

WEEK 6: UNIT TEST II

UNIT III FREQUENCY RESPONSE ANALYSIS

WEEK 7: 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

WEEK 8: Bode plot, use of Nichol's chart to compute resonance frequency and band width.

UNIT IV PHYSIOLOGICAL CONTROL SYSTEMS

WEEK 9: UNIT TEST III

Block diagram representation of the muscle stretch reflex, difference between engineering and physiological control systems,

WEEK 10: Generalized system properties, models with combination of system elements, introduction to simulation

WEEK 11: UNIT TEST IV

UNIT V PHYSIOLOGICAL SYSTEM MODELING

WEEK 12: Linear model of respiratory mechanics, model of chemical regulation of ventilation,

WEEK 13: linear model of muscle mechanics, model of regulation of cardiac output, model of neuromuscular reflex motion.

WEEK 14: UNIT TEST V

WEEK 15: ICD CLASSES

WEEK 16: MODEL EXAM

TEXT BOOKS:

1. M. Gopal "Control Systems Principles and design", Tata McGraw Hill ,2002
2. Benjamin C. Kuo, "Automatic control systems", Prentice Hall of India, 1995
3. Michael C K Khoo, "Physiological control systems", IEEE press, Prentice –Hall of India, 2001.

REFERENCES:

1. John Enderle, Susan Blanchard, Joseph Bronzino “Introduction to Biomedical Engineering” second edition, Academic Press, 2005.
2. Richard C. Dorf, Robert H. Bishop,” Modern control systems”,Pearson, 2004

BM2302 DIAGNOSTIC AND THERAPEUTIC EQUIPMENT

UNIT I CARDIAC EQUIPMENTS

WEEK 1: Electrocardiograph, Normal and Abnormal Waves, Heart rate monitor, Arrhythmia Simulator

WEEK2: Holter Monitor, Phonocardiography, Plethysmography. Cardiac Pacemaker-Internal and External Pacemaker–Batteries

WEEK 3: AC and DC Defibrillator- Internal and External.

UNIT II NEUROLOGICAL EQUIPMENTS

WEEK 4: UNIT TEST I

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

WEEK 5: Evoked Potential –Visual, Auditory and Somatosensory, MEG (Magneto Encephalon Graph). EEG Bio Feedback Instrumentation.

WEEK 6: UNIT TEST II

UNIT III SKELETAL MUSCULAR SYSTEM

WEEK 7: Sliding theory of contraction, recording and analysis of EMG waveforms, fatigue characteristics

WEEK 8: Muscle stimulators, nerve stimulators, Nerve conduction velocity measurement, EMG Bio Feedback Instrumentation.

UNIT IV RESPIRATORY MEASUREMENT SYSTEM

WEEK 9: UNIT TEST III

Instrumentation for measuring the mechanics of breathing – Spirometer-Lung Volume and vital capacity, measurements of residual volume, pneumotachometer -Airway resistance measurement,

WEEK 10: Whole body plethysmography, Intra-Alveolar and Thoracic pressure measurements, Apnea Monitor. Types of Ventilators – Pressure, Volume, and Time controlled. Flow, Patient Cycle Ventilators, Humidifiers, Nebulizers, Inhalators

WEEK 11: UNIT TEST IV

UNIT V SENSORY MEASUREMENT

WEEK 12: Psycho Physiological Measurements-for testing and sensory Responses, Electrooculo graph, Electro retino graph,

WEEK 13: Audiometer-Pure tone, Speech. EGG (Electro astrograph), galvanic skin resistance (GSR)

WEEK 14: UNIT TEST V

WEEK 15: ICD CLASSES

WEEK 16: MODEL EXAM

TEXT BOOKS:

1. Joseph J. Carr and John M. Brown, “Introduction to Biomedical equipment technology”, Pearson education, 2003.
2. John G.Webster, Medical Instrumentation Application and Design, third edition, Wiley India Edition, 2007.

REFERENCES:

1. Myer Kutz, “Standard Handbook of Biomedical Engineering & Design”, McGraw Hill, 2003.
2. Khandpur R.S, “Handbook of Biomedical Instrumentation”, Tata McGraw Hill, New Delhi, 2003.

3 L.A. Geddes and L.E. Baker, "Principles of Applied Biomedical Instrumentation",

4 Leslie Cromwell, "Biomedical Instrumentation and Measurement", Pearson Education, New Delhi, 2007.

BM2303 BIOMATERIALS AND ARTIFICIAL ORGANS

UNIT I STRUCTURE OF BIO-MATERIALS AND BIO-COMPATIBILITY

WEEK 1: Definition and classification of bio-materials, mechanical properties,

WEEK 2: 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,

WEEK 5: ceramic implant materials, 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.

WEEK 8: Bio polymers: Collagen and Elastin.

UNIT IV TISSUE REPLACEMENT IMPLANTS

WEEK 9: UNIT TEST III

Soft-tissue replacements, sutures, surgical tapes, adhesive, Percutaneous and skin implants, maxillofacial augmentation,

WEEK 10: Blood interfacing implants, hard tissue replacement implants, internal fracture fixation devices, joint replacements.

WEEK 11: UNIT TEST IV

UNIT V ARTIFICIAL ORGANS

WEEK 12: Artificial Heart, Prosthetic Cardiac Valves, Artificial lung (oxygenator),

WEEK 13: Artificial Kidney (Dialyser membrane), Dental Implants.

WEEK 14: UNIT TEST V

WEEK 15: ICD CLASSES

WEEK 16: MODEL EXAM

TEXT BOOKS:

1. Sujata V. Bhatt, Biomaterials Second Edition, Narosa Publishing House, 2005.
2. Joon B. Park Joseph D. Bronzino, Biomaterials - Principles and Applications – CRC Press, 2003

REFERENCES:

1. Park J.B., “Biomaterials Science and Engineering”, Plenum Press, 1984.
2. Standard Handbook of Biomedical Engineering & Design – Myer Kutz, McGraw-Hill, 2003
3. Introduction to Biomedical Engineering – John Enderle, Joseph D. Bronzino, Susan M. Blanchard, Elsevier, 2005.

EC2363 MICROPROCESSOR, MICROCONTROLLER AND SYSTEM DESIGN

UNIT I ARCHITECTURE OF 8085 /8086

WEEK 1: 8085- Functional Block Diagram- Description - Addressing Modes, Timing diagrams.

WEEK 2: 8086- Architecture, Instruction set, Addressing Modes.

WEEK 3: Introduction to 8087 -Architecture.

UNIT II 8086 ASSEMBLY LANGUAGE PROGRAMMING

WEEK 4: UNIT TEST I

Simple Assembly Language Programming, Strings, Procedures, Macros,

WEEK 5: Assembler Directives- Interrupts and Interrupt Applications.

WEEK 6: UNIT TEST II

UNIT III PERIPHERAL INTERFACING & APPLICATION

WEEK 7: Programmable Peripheral Interface (8255), keyboard display controller (8279), ADC, DAC Interface,

WEEK 8: Programmable Timer Controller (8254), Programmable interrupt controller (8259), Serial Communication Interface (8251).

UNIT IV MICROCONTROLLER

WEEK 9: UNIT TEST III

Architecture of 8051 Microcontroller- Instruction Set – Assembly Language Programming Branching, I/O and ALU Instructions.

WEEK 10: Programming 8051 - Timers, Serial Port, Interrupts. C programming for 8051

WEEK 11: UNIT TEST IV

UNIT V 8086 AND 8051 BASED SYSTEM DESIGN

WEEK 12: Design and interfacing - LED, LCD & Keyboard Interfacing, ADC, DAC, Sensor Interfacing, and External Memory Interface Traffic light controller,

WEEK 13: Washing machine, RTC

Interfacing using I2C Standard, Motor Control, Relay, PWM, DC, Stepper Motor Multichannel biomedical data acquisition system.

WEEK 14: UNIT TEST V

WEEK 15: ICD CLASSES

WEEK 16: MODEL EXAM

TEXTBOOKS:

1. Ramesh S. Gaonkar, Microprocessor Architecture Programming and Applications

with 8085. Fourth edition, Penram International Publishing

2. Douglas V.Hall, Microprocessor and Interfacing, Programming and Hardware.

Revised second Edition, Indian edition, Tata McGraw Hill,

3. Muhammad Ali Mazidi, Janice Gillispie Mazidi, Rolin D.MCKinlay
The 8051

Microcontroller and Embedded Systems, Second Edition, Pearson Education 2008.

REFERENCES:

1. Kenneth J.Ayala., “The 8051 Microcontroller, 3rd Edition, Thompson Delmar Learning, New Delhi, 2007.

2. A.K. Ray, K.M .Bhurchandi “Advanced Microprocessor and Peripherals”, Second edition, Tata McGraw-Hill, 2007.

3. Barry B.Brey, “The Intel Microprocessors Architecture, Programming and Interfacing” Pearson Education, New Delhi, 2007, and system design using 8085, 8086, 8051 and 8096, PHI, 2007.

4. Zdravko Karakehayov, “Embedded System Design with 8051 Microcontroller hardware and software”, Mercel Dekkar, 1999.

5. Krishna Kant, “ Microprocessor and Microcontroller Architecture, programming

a. and system design using 8085, 8086, 8051 and 8096, PHI, 2007

BM2304 HOSPITAL MANAGEMENT

UNIT I OVERVIEW OF HOSPITAL ADMINISTRATION

WEEK 1: Distinction between Hospital and Industry

WEEK 2: Challenges in Hospital Administration -Hospital Planning

WEEK 3: Equipment Planning – Functional Planning.

UNIT II HUMAN RESOURCE MANAGEMENT ON HOSPITAL

WEEK 4: UNIT TEST I

Principles of HRM – Functions of HRM – Profile of HRD Manager

WEEK 5: Tools of HRD –Human Resource Inventory – Manpower Planning.

WEEK 6: UNIT TEST II

UNIT III RECRUITMENT AND TRAINING

WEEK 7: Different Departments of Hospital, Recruitment, Selection, Training Guidelines –

WEEK 8: Methods of Training – Evaluation of Training – Leadership grooming and Training, Promotion – Transfer.

UNIT IV PLANNING SUPPORTIVE SERVICES

WEEK 9: UNIT TEST III

Medical Records Department – Central Sterilization and Supply Department

WEEK 10: Pharmacy Food Services - Laundry Services.

WEEK 11: UNIT TEST IV

UNIT V COMMUNICATION AND SAFETY ASPECTS IN HOSPITAL

WEEK 12: Purposes – Planning of Communication, Modes of Communication – Telephone, ISDN, Public Address and Piped Music – CCTV

WEEK 13: Security – Loss Prevention – Fire Safety – Alarm System – Safety Rules.

WEEK 14: UNIT TEST V

WEEK 15: ICD CLASSES

WEEK 16: MODEL EXAM

TEXT BOOKS:

1. R.C.Goyal, “Hospital Administration and Human Resource Management”, PHI –Fourth Edition, 2006.
2. G.D.Kunders, “Hospitals – Facilities Planning and Management – TMH, New Delhi –Fifth Reprint 2007.

REFERENCE:

1. Cesar A.Caceres and Albert Zara, “The Practice of Clinical Engineering, Academic Press, New York, 1977.

**BM2306 MICROPROCESSOR AND
MICROCONTROLLER LAB**

8085 based experiments

1. Assembly Language Programming of 8085

8086 based experiments

1. Programs for 16 bit Arithmetic, Sorting, Searching and String operations,
2. Programs for Digital clock, Interfacing ADC and DAC
3. Interfacing Programming 8279, 8259, and 8253.

4. Serial Communication between two Microprocessor Kits using 8251.
5. Interfacing and Programming of Stepper Motor and DC Motor Speed control and Parallel Communication between two Microprocessor Kits
6. Macroassembler Programming for 8086

8051 based experiments

1. Programming using Arithmetic, Logical and Bit Manipulation instructions of 8051 microcontroller.
2. Programming and verifying Timer, Interrupts and UART operations in 8051 microcontroller.
3. Interfacing – DAC and ADC and 8051 based temperature measurement
4. Interfacing – LED and LCD
5. Interfacing – stepper motor traffic light control
6. Communication between 8051 Microcontroller kit and PC.

BM2307 BIO MEDICAL INSTRUMENTATION LAB

1. Design of low noise pre-amplifier for ECG
2. Study of characteristics of temperature sensors, thermistor, thermocouple and RTD
3. Measurement of pulse rate using photo transducer
4. Measurement of respiration rate
5. Measurement of blood flow velocity using ultrasound
6. Study of ESU – cutting and coagulation modes
7. pH Measurement and conductivity test
8. Measurement of heart rate using F-V converter
9. Galvanic skin resistance (GSR) measurements
10. Recording of Audiogram

GE2321 COMMUNICATION SKILLS LABORATORY

A. ENGLISH LANGUAGE LAB

1.LISTENING COMPREHENSION:

Listening and typing – Listening and sequencing of sentences –Filling in the blanks -Listening and answering

2.READING COMPREHENSION:

Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

3.SPEAKING:

Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English. Conversations: Face to Face Conversation – Telephone conversation Role play

B. DISCUSSION OF AUDIO-VISUAL MATERIALS (6PERIODS) **(Samples are available to learn and practice**

1. RESUME / REPORT PREPARATION / LETTER WRITING 1

Structuring the resume / report - Letter writing / Email Communication - Samples.

2. PRESENTATION SKILLS: 1

Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3. SOFT SKILLS: 2

Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples

4. GROUP DISCUSSION: 1

Why is GD part of selection process ? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD –Video samples

5. INTERVIEW SKILLS: 1

Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews- Video samples.

II. Practice Session

- 1. Resume / Report Preparation / Letter writing:** Students prepare their own resume and report.
- 2. Presentation Skills:** Students make presentations on given topics.
- 3. Group Discussion:** Students participate in group discussions.
- 4. Interview Skills:** Students participate in Mock Interviews

REFERENCES:

1. Anderson, P.V, **Technical Communication**, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Prakash, P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., Second Edition, New Delhi, 2004.
3. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi, 2004.
4. Evans, D, **Decisionmaker**, Cambridge University Press, 1997.
- Thorpe, E, and Thorpe, S, **Objective English**, Pearson Education, Second Edition, New Delhi, 2007.
6. Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addison Wesley Longman Ltd., Indian reprint 1998.