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 2015 - 2016

DEPARTMENT OF BIO MEDICAL ENGINEERING

IV YEAR DEGREE COURSE

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WEEK DETAILS

SL.NO.	WEEK	FROM	TO
1	**WEEK1**	**24.06.2015**	**26.06.2015**
2	**WEEK2**	**29.06.2015**	**03.07.2015**
3	**WEEK3**	**06.07.2015**	**10.07.2015**
4	**WEEK4**	**13.07.2015**	**17.07.2015**
5	**WEEK5**	**20.07.2015**	**24.07.2015**
6	**WEEK6**	**27.07.2015**	**28.07.2015**
7	**WEEK7**	**03.08.2015**	**07.08.2015**
8	**WEEK8**	**10.08.2015**	**14.08.2015**
9	**WEEK9**	**17.08.2015**	**21.08.2015**
10	**WEEK10**	**24.08.2015**	**28.08.2015**
11	**WEEK11**	**31.08.2015**	**04.09.2015**
12	**WEEK12**	**07.09.2015**	**11.09.2015**
13	**WEEK13**	**14.09.2015**	**18.09.2015**
14	**WEEK14**	**21.09.2015**	**25.09.2015**
15	**WEEK15**	**28.09.2015**	**30.09.2015**
16	**WEEK16**	**05.10.2015**	**09.10.2015**
17	**WEEK17**	**12.10.2015**	**16.10.2015**
18	**WEEK18**	**19.10.2015**	**20.10.2015**
19	**WEEK19**	**27.10.2015**	**30.10.2015**

SUBJECT CONTENTS

SL.NO	SUBJECT CODE	SUBJECT NAME
THEORY		
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
PRACTICAL		
7	BM6511	Microprocessor and Microcontroller Laboratory
8	BM6512	Bio Medical Instrumentation Laboratory
9	GE6674	Communication and Soft Skills - Laboratory Based

TEST / EXAM SCHEDULE

SL.NO	SUBJECT CODE	SUBJECT NAME	UNIT TEST I	UNIT TEST II	Pre Model Exam	UNIT TEST IV
1	BM6501	Bio Control Systems	13.07.2015	03.08.2015	21.08.2015	14.09.2015
2	BM6502	Diagnostic and Therapeutic Equipment - I	14.07.2015	04.08.2015	22.08.2015	15.09.2015
3	BM6503	Bio Materials and Artificial Organs	15.07.2015	05.08.2015	24.08.2015	16.09.2015
4	BM6504	Biomedical Instrumentation	16.07.2015	06.08.2015	25.08.2015	18.09.2015
5	EC6504	Microprocessor and Microcontroller	17.07.2015	07.08.2015	26.08.2015	21.09.2015
6	MD6501	Hospital Management	20.07.2015	10.08.2015	27.08.2015	22.09.2015

SL.NO	SUBJECT CODE	SUBJECT NAME	MODEL EXAM
1	BM6501	Bio Control Systems	05.10.2015
2	BM6502	Diagnostic and Therapeutic Equipment - I	06.10.2015
3	BM6503	Bio Materials and Artificial Organs	07.10.2015
4	BM6504	Biomedical Instrumentation	08.10.2015
5	EC6504	Microprocessor and Microcontroller	09.10.2015
6	MD6501	Hospital Management	12.10.2015

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

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 oxygenerators, 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

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, Acryrilic 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 decullarized matrix biomaterials for tissue repair. Softtissue 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

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, pO2 and pCO2, 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

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

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. Doughlas 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 behaviour

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: CYCLE TEST III

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 21st 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 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

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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